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Unusual Machine Work in Seattle

By FRED H. COLVIN
Editor, *American Machinist*

Special turnbuckles and crankshafts—A portable slotting machine built by the Seattle Machine Works and some of the unusual work that has been done by it

THOSE who are accustomed to building a regular product of small or moderate size, and in quantities which warrant special tools and fixtures, would be as much out of place in the average Pacific coast shop, as the old time mechanic would be in a modern automobile factory. The all round mechanic, with modern ideas has a great field in the far west, and is likely to hold his own for many years to come.

When it comes to variety of work it is difficult to find a shop which seems to attract it more than the Seattle Machine Works, Seattle, Wash., of which Eric Johnson is the guiding spirit.

Just to give some idea as to the variety of work that comes along, Fig. 1 shows two types of turnbuckles, those in the foreground being of unusual construction. The right- and left-hand nuts are rectangular slabs of steel held together by heavy round bars, which are shouldered on the inside and riveted on the outside.

Just behind the turnbuckle are two large shafts, while at the right is a heavy trolley for a special traveler. Contrast with these, the three-throw crankshafts shown in Fig. 2, finished all over, with dovetailed projections for holding counterweights to the crank webs. The shafts also have the thrust rings turned next to the flange.

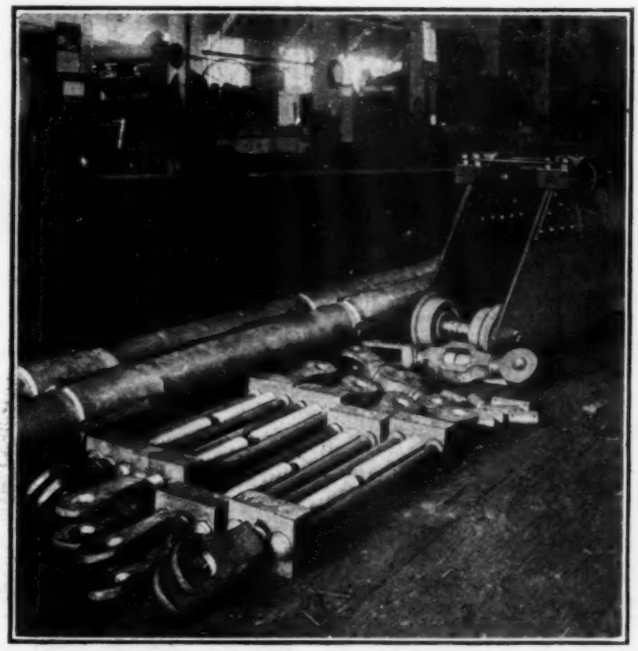

FIG. 1—TURNBUCKLES AND OTHER ODD WORK

Another crankshaft job is shown in the lathe in Fig. 3, being of a very different type from those shown in the previous illustration. As will be seen this crankshaft is very long and slim and has to be carefully supported for turning. The method of supporting in the steadyrest is to use the split disk *A*, which runs in the steadyrest and can be moved along the shaft so as to be close to the pin being turned. The disk for locating the different throws is shown at *B*, and the bolt *C*, used as a jack, helps to prevent spring due to the end thrust. A jib crane on a post behind the lathe makes it easy to handle work in and out of the lathe.

In common with other Seattle firms, this company handles a large amount of marine work, much of which runs into large sizes. And in many cases the surfaces to be machined are very difficult to get at with the ordinary types of machine tools. In order to facilitate surfacing work on pieces of this kind, the company built a special portable slotting, or vertical planing machine, Figs. 4 and 5, which has proved very useful. It consists of a heavy bed of sufficient length to handle most work at one setting. On this is mounted a tool or driving head which carries an 8-in. square bar having a long stroke, driven and controlled by suitable gearing.

One use of this machine is shown in Fig. 4, where it is mounted on a large casting for the bed of a marine engine. The slotting machine is held in position by means of substantial clamps. The timbers are set at an angle to help prevent vibration and steady the whole combination. The left side and bottom of the upper pedestal have been planed, and the machine is shown at work on the lower bearing. Even though the bar is 8 in. square, there is bound to be considerable spring with such a long overhang, so the angle plates *A* are used to support the tool against the thrust of the cut.

The method of holding the angle plates is rather interesting. Beginning with the jack *B*, below the lower pedestal, next comes jack *C*, and the block of wood above it, holding the angle plates to the lower pedestal, while the braces *D* take the thrust of the tool bar and

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FIG. 2—THREE THROW CRANKSHAFTS READY FOR COUNTERWEIGHTS

transfers it to the upper pedestal. The end of the bar bears against the edge of the upper angle plate, which supports it, an extension tool holder being used to reach the lower surfaces. This extension tool head can be turned to cut a radius in the corner of the pedestal jaw.

Another Use for a Portable Machine

Quite a different use of this portable machine is shown in Fig. 5, where it is machining the outside of the hub surrounding the propeller shaft on a rudder frame for a large ship. Here the frame of the machine is mounted on a circular base so that it can be revolved in order to plane the outside of the hub.

The method of swinging the frame of the machine to plane the outside of the hub is interesting in itself.

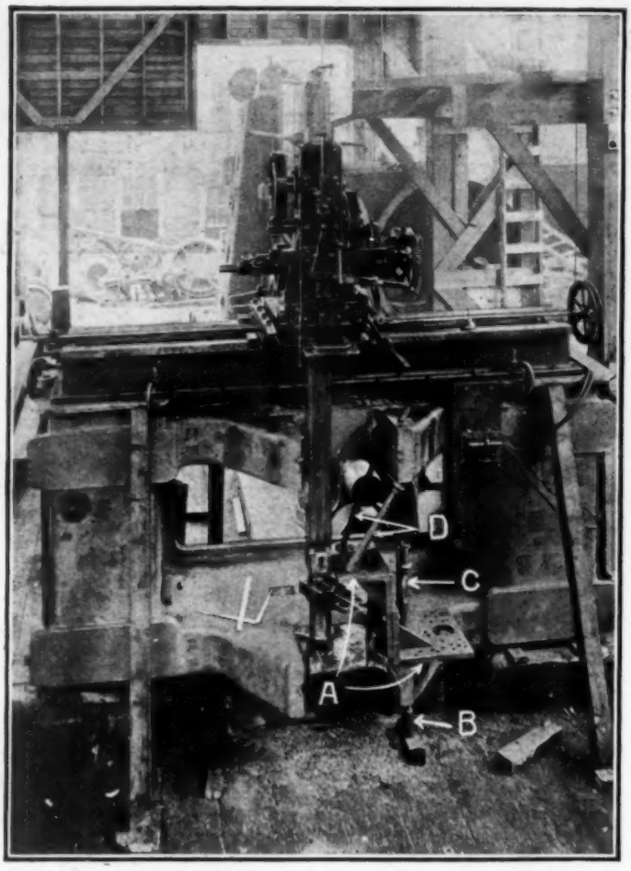


FIG. 4—SLOTTING PEDESTALS WITH SPECIAL MACHINE

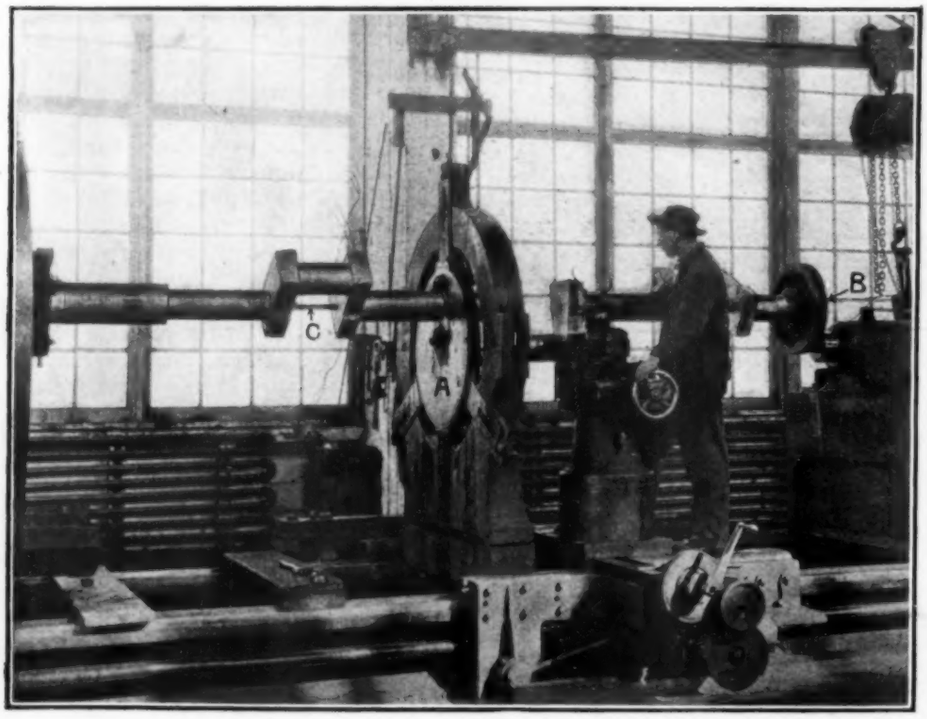


FIG. 3—TURNING A LIGHT CRANKSHAFT

Mounted at the extreme left is an angle plate carrying a worm gear mechanism at *A*. This worm is actuated by the handwheel *B* and below is the drum *C*. This drum carries a small steel cable shown at *D*, the ends being fastened to opposite ends of the frame of the planing machine. Turning the handwheel moves the worm, and with it the drum and the cable, which swings the frame of the machine, feeding the tool around the hub as desired. It is a most convenient arrangement for such a job.

The rudder frame itself is an awkward piece to support for any kind of machining. The hub rests on four round blocks, while the long right-hand end of the frame is supported by screw jacks, and a block at the extreme right holds the outer edge. Long hairpin clamps tie the frame to the large floor plate.

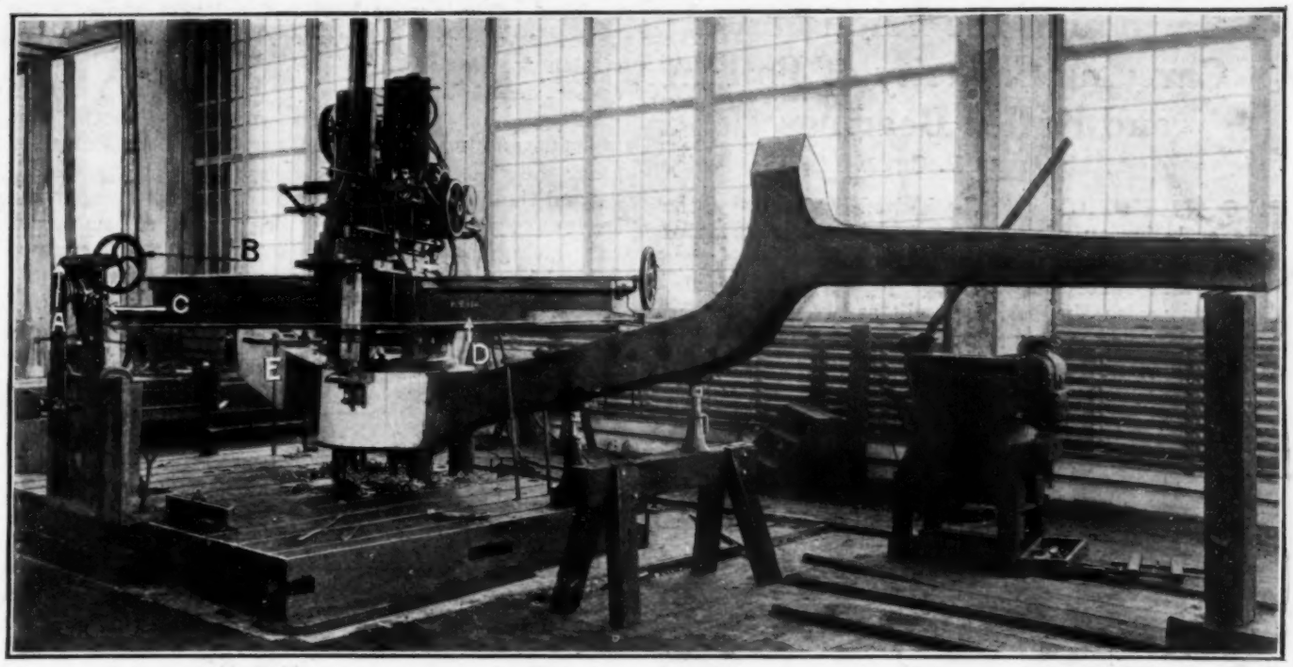


FIG. 5—PLANING OUTSIDE OF RUDDER FRAME HUB

The versatility of this machine is shown by the planing of the lower end of the rudder frame at *E*. Such a job as machining this frame would tax the ingenuity and resources of almost any shop, unless a portable machine similar to the one described was available for use when wanted.

More About the Drawing Room

BY H. H. ARMSTRONG

In Vol. 58, page 840 of the *American Machinist*, J. C. P. Bode is right when he says that the drawing room should be the "clearing house" of information, for it is there that the actual development of a machine or piece of apparatus is performed. When the prints finally leave for the factory, they should represent a practical piece of apparatus free from defects.

In order to clearly set forth the duties of a drawing room, the writer would like to relate what was expected of him while foreman of a drawing room for seven years.

When an inquiry was received from a customer for the cost of a number of units along the same general line, it was immediately turned over to the drawing room for the preparation of a cost estimate drawing. On this drawing the layout man would clearly set forth the construction, material and other points needed, for the cost estimating engineer only, so that if the price was not to the customer's liking, there would not be a large amount of money tied up in useless drawings. If in due time, the estimate was satisfactory to the customer, a requisition would be placed for these units.

The drawing room was then requested to go ahead with the detail design for production. When the drawings were completed and checked, a meeting was called consisting of the engineer, production man, tool superintendent, factory foreman, and the foreman of the drawing room. This committee reviewed each drawing, and comments were made as to the best method of manufacture. If the production on that apparatus was to be large, the tool equipment was decided on. If the production was limited, only sufficient tools were made to do the work to best advantage, and sheet metal templates were substituted in place of jigs and fixtures. Minutes were always kept of these meetings, and when the meeting was over, the drawing room foreman would order the tool equipment drawn up and submitted to the engineer for approval.

After the drawings were sent out it was the duty of the drawing room to prepare a material list, covering the amount of material needed for the entire requisition or manufacturing order. Upon completion of the material list, the production clerk promptly placed orders for the raw material, with outside manufacturers generally. These orders would state the date when the material would be required, so that while the tool department was working on the jigs, fixtures, or templates, the material for the work would be coming along.

Samples from the dies, jigs and molds were always delivered to the drawing room for inspection, and if these were acceptable the factory was notified to go ahead with production. It seemed to be an unwritten law in the factory to refer everything questionable to the drawing room for advice and adjustment.

Lastly the drawing room was a "clearing house" for information to the factory by issuing a daily bulletin for new and changed drawings. This bulletin listed all drawings sent out. If they were new it stated whether tools and patterns were required, and if changed, the bulletin would also state what tools and patterns were affected. By this means all departments were kept in touch with what was going out into production, and all delays were automatically explained.

The bulletin found its way into every department and the factory, by keeping in touch with it, was never handicapped by working to drawings that were out of date. When the new drawing came along, the old one was automatically called in and destroyed.

Determining the Friction and Carrying Capacity of Ball and Roller Bearings

By Allen P. Child

IN CONJUNCTION with the United States Navy, the Federal Bureau of Standards conducted a series of experiments to obtain data on the frictional resistance of ball and roller bearings at low speeds, and also the loads which the bearings will safely sustain. In training large guns it is desirable to reduce the friction at the trunnion bearings, which parts are moved at

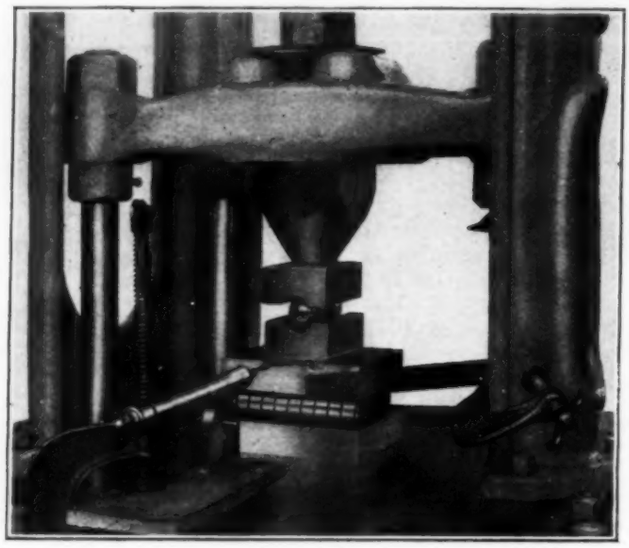


FIG. 1—MEASURING THE STATIC FRICTION OF BALL BEARINGS

very low speeds and infrequently. Regardless of these facts the bearings are subjected to great loads when the gun is fired. The conditions usual for bearings in engineering work are much different than these conditions, as bearings are seldom subject to great loads or impact.

Measuring the Static Friction

In making a static friction test on a ball bearing two balls were used with each pair of races, in order to secure stability in the loaded condition. A plate mounted on two rollers carried the lower ball race, as shown in Fig. 1, while the upper ball race was loaded by a three-screw testing machine having a capacity of 50,000 lb. Between the movable head of the testing machine and the upper ball race a spherical bearing was used. When the desired load had been applied the lower ball race was drawn forward by a force exerted through the spring balance, which rested on a low-friction roller. The smallest division on the spring balance represented 1 ounce.

In finding the friction of the rollers certain conditions were secured. All bearing surfaces were parallel to each other and also perpendicular to the action line of the load. The balls and rollers were also placed symmetrically with relation to the action line of the load. The load was applied equally to the balls and rollers by a spherical bearing block.

Through these tests it was found that the starting friction is nearly the same for both sizes of groove employed. The groove having the larger radius gave the lower value for the friction. The ratio of starting friction to the load increases slowly as the load increases, then much more rapidly. The rapid rise in the friction at greater loads seems to indicate that internal work was being performed on the material of either the balls or races, which work might cause heating and their destruction if the bearings were operated continuously under loads greater than the critical loads. Or reducing the static frictional resistance it is claimed that oil is of little, if any, use upon ball bearings.

Static friction of rollers loaded between two steel plates was measured in the same manner as the balls. A bearing having a radius of 10 in. showed that the static friction is nearly constant up to a load of 25,000 lb., and that for greater loads the friction increases rapidly. This action is similar to the behavior of the balls, and it is claimed that this critical load should be considered the allowable load on the roller.

Compression Tests for Maximum Load

The allowable load on a bearing may be determined by noting the greatest load which the bearing will sustain without permanent deformation. The same apparatus that was used for the friction tests was used for the compression tests, and a single ball was placed between the races and the load applied by the testing machine. A special apparatus was designed to measure the relative motion of the two races; that is, the deformation of balls and races combined.

At each corner of the races is a steel rod secured to one race, as is shown in Fig. 2. Opposite it is a short steel lever carried by a horizontal shaft which is held in any position in which it may be placed, by means of caps for the bearings that are loaded by long helical springs. Experience with the apparatus showed that the best results were obtained when the shaft rested in a triangular groove in the supports. The caps for the bearings were also grooved, but were later turned over to present a plane surface to

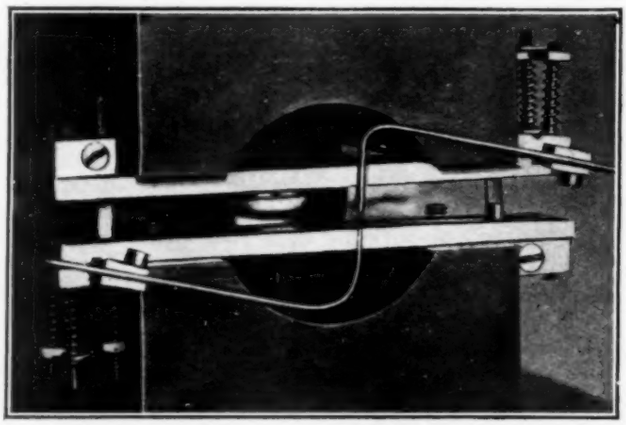


FIG. 2—MECHANISM FOR INDICATING THE DEFORMATION OF BALLS AND RACES

the shaft, which was then held in a three-line bearing.

The end of the shaft which projects from the bearing carries a curved pointer, the end of which opposes the end of the pointer on the other side of the races. In use the pointers are turned away from each other, the desired load is applied to the bearing, and then the pointers are turned toward each other by hand so that each lever previously referred to comes in con-

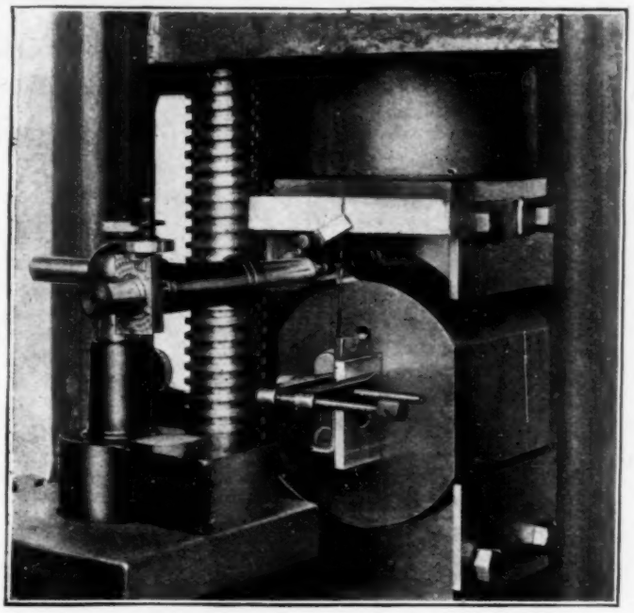


FIG. 3—APPARATUS FOR MEASURING THE DEFORMATION OF A ROLLER BETWEEN RACES

tact with its corresponding rod. The distance between the two pointers is measured by means of a micrometer microscope. It is claimed that the arrangement of this apparatus is such as to give correct values, even if the races are slightly tilted during the tests. The total deformation under load of the ball and race combined may be obtained, as well as the permanent deformation, after removing the load.

Measuring the Deformation

The pointers multiplied the movements of the levers ten times. The arrangement of the pointers, in pairs, made the change in distance between pointers twenty times the change in the distance between the races. Two microscopes, one at each end of the races, were used, by which instruments a difference of 0.00004 in. in the distance between the pointers could be observed and estimated. The displacement of either end of the ball race could be measured within 0.000004 in. A thin film of lubricating oil on the surface of the race was used for making visible the area of contact between the ball and race.

When determining the maximum allowable load for roller bearings, the arrangement shown in Fig. 3 was employed. The bearing was held in a race having an inner diameter of 7 in., was loaded by means of the testing machine, and the relative movement between the two pointers secured to the races was observed through the microscope. There is no need for going through the detail of the work, as its principle can readily be grasped. The results obtained are of great value in understanding the action of the bearing parts.

The New Screw Thread Standard—IV

By RALPH E. FLANDERS
General Manager, Jones & Lamson Machine Co.

Discussion of the Screw Thread Report of the A.E.S.C.—Condensed tables of dimensions for different classes of fits—Fine and coarse threads—Numbered and fractional sizes

THE TABLES given with this installment of the discussion on the Screw Thread Standard Report recently given out by the American Engineering Standards Committee show in one column for each size all the useful dimensions, both in the form of measurements and of tolerances, for both screws and nuts. The lead and angle tolerances permitted by the pitch diameter tolerances are also given. In fact, everything that workman, toolmaker or designer can desire is given in one place.

This useful condensation of the report has been made possible by a simplification of the standard recently approved of by the Sectional Committee and the Commission. The simplification omits the maximum major diameter for all nuts and tapped holes, as described below; and it makes the sizes and tolerances for the major and minor diameters of screws for all classes of fit here listed, the same as for those of Class 2.

The condensation has required a rearrangement and renumbering of the tables in the Report. The original plan will be preferred for some uses, but the writer believes that the tables as published here will in general be found more convenient.

IV—CLASSIFICATION OF FITS

1—DESCRIPTION

There are established herein for general use four distinct classes of screw-thread fits as specified in the following brief outline. The examples given under each class of fit are for the purpose of illustration only.

Loose Fit *(Class 1)* — Recommended as a commercial standard for tapped holes in the numbered sizes only. May be used with screws of other classes to obtain quality of fit desired. (See Appendix C).

Free Fit *(Class 2)*—Includes the great bulk of screw-thread work of ordinary quality of finished and semi-finished bolts and nuts, etc. (Called "Medium Fit Regular" in the N.S.T.C. "Progress Report".)

Medium Fit *(Class 3)*—Includes the better grade of interchangeable screw-thread work, such as automobile bolts and nuts. (Called "Medium Fit Special" in N.S.T.C. "Progress Report".)

Table II—Coarse-Thread Series—American

Figures taken from the Screw Thread Standard Report

				1/4-20	5/16-18	3/8-16	7/16-14	1/2-13	9/16-12	5/8-11
(1)	Size and threads, per inch									
	SCREWS AND BOLTS									
(2)	All fits	Major diam.	Max. (Basic)	0.2500	0.3125	0.3750	0.4375	0.5000	0.5625	0.6250
(3)	All fits	Major diam.	Min.	0.2428	0.3043	0.3660	0.4277	0.4896	0.5513	0.6132
(4)	All fits	Major diam.	Tol.	0.0072	0.0082	0.0090	0.0098	0.0104	0.0112	0.0118
(5)	All fits	Minor diam.	Max. (Note a)	0.1887	0.2443	0.2983	0.3499	0.4056	0.4603	0.5135
(6)	Class 2—Free fit	Pitch diam.	Max. (Basic)	0.2175	0.2764	0.3344	0.3911	0.4500	0.5084	0.5660
(7)	Class 2—Free fit	Pitch diam.	Min.	0.2139	0.2723	0.3299	0.3862	0.4448	0.5028	0.5601
(8)	Class 2—Free fit	Pitch diam.	Tol. (Note b)	0.0036	0.0041	0.0045	0.0049	0.0052	0.0056	0.0059
(9)	Class 3—Medium fit	Pitch diam.	Max. (Basic)	0.2175	0.2764	0.3344	0.3911	0.4500	0.5084	0.5660
(10)	Class 3—Medium fit	Pitch diam.	Min.	0.2149	0.2734	0.3312	0.3875	0.4463	0.5044	0.5618
(11)	Class 3—Medium fit	Pitch diam.	Tol. (Note b)	0.0026	0.0030	0.0032	0.0036	0.0037	0.0040	0.0042
(12)	Class 4—Close fit	Pitch diam.	Max.	0.2178	0.2767	0.3348	0.3915	0.4504	0.5089	0.5665
(13)	Class 4—Close fit	Pitch diam.	Min.	0.2165	0.2752	0.3332	0.3897	0.4485	0.5069	0.5644
(14)	Class 4—Close fit	Pitch diam.	Tol. (Note b)	0.0013	0.0015	0.0016	0.0018	0.0019	0.0020	0.0021
	NUTS AND TAPPED HOLES									
(15)	All fits	Major diam.	Min. (Basic) (Note c)	0.2500	0.3125	0.3750	0.4375	0.5000	0.5625	0.6250
(16)	All fits	Minor diam.	Max.	0.2013	0.2584	0.3141	0.3679	0.4251	0.4813	0.5364
(17)	All fits	Minor diam.	Min.	0.1959	0.2524	0.3073	0.3602	0.4167	0.4723	0.5266
(18)	All fits	Minor diam.	Tol.	0.0054	0.0060	0.0068	0.0077	0.0084	0.0090	0.0098
(19)	All fits	Pitch diam.	Min. (Basic)	0.2175	0.2764	0.3344	0.3911	0.4500	0.5084	0.5660
(22)	Class 2—Free fit	Pitch diam.	Max.	0.2211	0.2805	0.3389	0.3960	0.4552	0.5140	0.5719
(23)	Class 2—Free fit	Pitch diam.	Tol. (Note b)	0.0036	0.0041	0.0045	0.0049	0.0052	0.0056	0.0059
(24)	Class 3—Medium fit	Pitch diam.	Max.	0.2201	0.2794	0.3376	0.3947	0.4537	0.5124	0.5702
(25)	Class 3—Medium fit	Pitch diam.	Tol. (Note b)	0.0026	0.0030	0.0032	0.0036	0.0037	0.0040	0.0042
(26)	Class 4—Close fit	Pitch diam.	Max.	0.2188	0.2779	0.3360	0.3929	0.4519	0.5104	0.5681
(27)	Class 4—Close fit	Pitch diam.	Tol. (Note b)	0.0013	0.0015	0.0016	0.0018	0.0019	0.0020	0.0021
	THREAD FORM									
(28)	Depth of thread			0.03248	0.03608	0.04059	0.04639	0.04996	0.05413	0.05905
(29)	Pitch			0.05000	0.05556	0.06250	0.07143	0.07692	0.08333	0.09091
(30)	Basic width of flat = 1/8 x pitch (Note a)			0.00625	0.00694	0.00781	0.00893	0.00962	0.01042	0.01136
(31)	Min. width of fit = 1/24 x pitch (Note c)			0.00208	0.00231	0.00260	0.00298	0.00321	0.00347	0.00379
(32)	Helix angle at basic pitch diam.			4° 11′	3° 40′	3° 24′	3° 19′	3° 6′	2° 59′	2° 55′
	LEAD AND FORM TOLERANCES									
(35)	Class 2—Free fit	Lead tolerance (Note b)		0.0010	0.0012	0.0013	0.0014	0.0015	0.0016	0.0017
(36)	Class 2—Free fit	Tol. in 1/2′ angle (Note b)		1° 24′	1° 26′	1° 24′	1° 20′	1° 19′	1° 18′	1° 15′
(37)	Class 3—Medium fit	Lead tolerance (Note b)		0.0008	0.0009	0.0009	0.0010	0.0011	0.0012	0.0012
(38)	Class 3—Medium fit	Tol. in 1/2′ angle (Note b)		1° 2′	1° 4′	1° 1′	1° 0′	57′	57′	55′
(39)	Class 4—Close fit	Lead tolerance (Note b)		0.0004	0.0004	0.0005	0.0005	0.0005	0.0006	0.0006
(40)	Class 4—Close fit	Tol. in 1/2′ angle (Note b)		30′	30′	30′	29′	28′	28′	27′

EXPLANATORY NOTES FOR TABLES

(Note a)—Dimensions given are figured to the intersection of the worn tool arc with a center line through crest and root. Minimum flat at root equals $\frac{1}{8} \times p$.

(Note b)—The tolerances specified for pitch diameter are cumulative, and include all errors of lead and angle. The full tolerance on the pitch diameter is therefore not available unless the lead and angle of the thread are perfect. Lines 35 to 40 inclusive give, for information, the error in lead (per length of thread engaged) and in angle, which can each be compensated for by half the tolerance on the pitch diameter shown in lines 8, 11, 14, 21, 23, 25 and 27. If lead and angle error both exist to the amount tabulated, the pitch diameter of a bolt, for example, must be reduced by the full tolerance or it will not enter a basic nut or gage. If no lead error existed on such a bolt, the angle error could be twice that given, and conversely; but these extreme conditions are not contemplated as being desirable. See Appendix (B).

(Note c)—Dimensions given are allowable only with a tap having theoretically sharp corners. The threaded hole must not reject a correct basic "Go" gage by interference with the rounded roots due to a worn tap. Minimum flat at the root equals $\frac{1}{24} \times p$.

Close Fit *(Class 4)*—Includes screw-thread work requiring a fine snug fit, somewhat closer than the medium fit, such as high-grade aircraft parts, etc. In this class of fit selective assembly of parts may be required. It is not considered practicable as a commercial standard for tapped holes of the numbered sizes.

Section 2 on the "Recommended method of obtaining medium fit," and Section 3 covering "Special conditions" are left for consideration in a later installment.

4—GENERAL SECIFICATIONS

The following general specifications will apply to all classes of fits specified in the body of the report. (See Appendix (C) for special specifications applying to loose fits).

(a) *Uniform Minimum Nut*—The pitch diameter of the minimum threaded hole or nut corresponds to the basic size, variations being permitted above the basic size. The major and minor diameters of the minimum nut are also uniform for all class of fit.

(b) *Uniform Tap Drill Sizes*—The maximum and minimum minor diameters and the consequent minor diameter tolerances are the same for all nuts of a given size for all classes of fit. This permits uniform tap drill sizes for all classes of fit.

(c) *Uniform Major Diameter of Screws*—The maximum and minimum major diameters are the same for all screws of a given size for all classes of fit herein tabulated.

(National) Standard Screw Threads—¼ to 3 Inches

of the American Engineering Standards Committee

(1)	¾-10	⅞-9	1-8	1⅛-7	1¼-7	1⅜-6	1½-5	2-4½	2¼-4½	2½-4	2¾-4	3-4	(1)
(2)	0.7500	0.8750	1.0000	1.1250	1.2500	1.5000	1.7500	2.0000	2.2500	2.5000	2.7500	3.0000	(2)
(3)	0.7372	0.8610	0.9848	1.1080	1.2330	1.4798	1.7268	1.9746	2.2246	2.4720	2.7220	2.9720	(3)
(4)	0.0128	0.0140	0.0152	0.0170	0.0170	0.0202	0.0232	0.0254	0.0254	0.0280	0.0280	0.0280	(4)
(5)	0.6273	0.7387	0.8466	0.9497	1.0747	1.2955	1.5046	1.7274	1.9774	2.1933	2.4433	2.6933	(5)
(6)	0.6850	0.8028	0.9188	1.0322	1.1572	1.3917	1.6201	1.8557	2.1057	2.3376	2.5876	2.8376	(6)
(7)	0.6786	0.7958	0.9112	1.0237	1.1487	1.3816	1.6085	1.8430	2.0930	2.3236	2.5736	2.8236	(7)
(8)	0.0064	0.0070	0.0076	0.0085	0.0085	0.0101	0.0116	0.0127	0.0127	0.0140	0.0140	0.0140	(8)
(9)	0.6850	0.8028	0.9188	1.0322	1.1572	1.3917	1.6201	1.8557	2.1057	2.3376	2.5876	2.8376	(9)
(10)	0.6805	0.7979	0.9134	1.0263	1.1513	1.3846	1.6119	1.8468	2.0968	2.3279	2.5779	2.8279	(10)
(11)	0.0045	0.0049	0.0054	0 0059	0.0059	0.0071	0.0082	0.0089	0.0089	0.0097	0.0097	0.0097	(11)
(12)	0.6856	0.8034	0.9195	1.0330	1.1580	1.3926	1.6211	1.8568	2.1068	2.3389	2.5889	2.8389	(12)
(13)	0.6833	0.8010	0.9168	1.0300	1.1550	1.3890	1.6170	1.8524	2.1024	2.3341	2.5841	2.8341	(13)
(14)	0.0023	0.0024	0.0027	0.0030	0.0030	0.0036	0.0041	0.0044	0.0044	0.0048	0.0048	0.0048	(14)
(15)	0.7500	0.8750	1.0000	1.1250	1.2500	1.5000	1.7500	2.0000	2.2500	2.5000	2.7500	3.0000	(15)
(16)	0.6526	0.7667	0.8782	0.9858	1.1108	1.3376	1.5551	1.7835	2.0335	2.2564	2.5064	2.7564	(16)
(17)	0.6417	0.7547	0.8647	0.9704	1.0954	1.3196	1.5335	1.7594	2.0094	2.2294	2.4794	2.7294	(17)
(18)	0.0109	0.0120	0.0135	0.0154	0.0154	0.0180	0.0216	0.0241	0.0241	0.0270	0.0270	0.0270	(18)
(19)	0.6850	0.8028	0.9188	1.0322	1.1572	1.3917	1.6201	1.8557	2.1057	2.3376	2.5876	2.8376	(19)
(22)	0.6914	0.8098	0.9264	1.0407	1.1657	1.4018	1.6317	1.8684	2.1184	2.3516	2.6016	2.8516	(22)
(23)	0.0064	0.0070	0.0076	0.0085	0.0085	0.0101	0.0116	0.0127	0.0127	0.0140	0.0140	0.0140	(23)
(24)	0.6895	0.8077	0.9242	1.0381	1.1631	1.3988	1.6283	1.8646	2.1146	2.3473	2.5973	2.8473	(24)
(25)	0.0045	0.0049	0.0054	0.0059	0.0059	0.0071	0.0082	0.0089	0.0089	0.0097	0.0097	0.0097	(25)
(26)	0.6873	0.8052	0.9215	1.0352	1.1602	1.3953	1.6242	1.8601	2.1101	2.3424	2.5924	2.8424	(26)
(27)	0.0023	0.0024	0.0027	0.0030	0.0030	0.0036	0.0041	0.0044	0.0044	0.0048	0.0048	0.0048	(27)
(28)	0.06495	0.07217	0.08119	0.09279	0.09279	0.10825	0.12990	0.14434	0.14434	0.16238	0.16238	0.16238	(28)
(29)	0.10000	0.11111	0.12500	0.14286	0.14286	0.16667	0.20000	0.22222	0.22222	0.25000	0.25000	0.25000	(29)
(30)	0.01250	0.01389	0.01562	0.01786	0.01786	0.02083	0.02500	0.02778	0.02778	0.03125	0.03125	0.03125	(30)
(31)	0.00417	0.00463	0.00521	0.00595	0.00595	0.00694	0.00833	0.00926	0.00926	0.01042	0.01042	0.01042	(31)
(32)	2° 39′	2° 31′	2° 29′	2° 32′	2° 15′	2° 12′	2° 15′	2° 11′	1° 55′	1° 57′	1° 46′	1° 36′	(32)
(35)	0.0018	0.0020	0.0022	0.0024	0.0024	0.0029	0.0033	0.0037	0.0037	0.0040	0.0040	0.0040	(35)
(36)	1° 14′	1° 13′	1° 11′	1° 9′	1° 9′	1° 10′	1° 7′	1° 6′	1° 6′	1° 5′	1° 5′	1° 5′	(36)
(37)	0.0013	0.0014	0.0016	0.0017	0.0017	0.0020	0.0024	0.0026	0.0026	0.0028	0.0028	0.0028	(37)
(38)	54′	52′	51′	49′	49′	50′	48′	47′	47′	46′	46′	46′	(38)
(39)	0.0007	0.0007	0.0008	0.0009	0.0009	0.0010	0.0012	0.0013	0.0013	0.0014	0.0014	0.0014	(39)
(40)	27′	25′	25′	24′	24′	24′	24′	23′	23′	23′	23′	23′	(40)

There are good reasons for giving no values for the maximum major diameter of the nut, or for the resulting tolerance. These reasons are:

First, it is never measured, as intimated above, by any gage in practical use. Second, no harm from lack of strength or other defect can come in a nut or tapped hole in ordinary applications even if the major diameter is increased to the theoretical maximum or sharp "V." Third, the only harm that can arise from an enlarged major diameter is an undue sharpening of the crests of the cutting teeth in the tap, with a consequent tendency to rapid wear. But this is a matter which relates to tool standardization rather than to product standardization. Note (c) in the tables limits the sharpness of the tooth to a minimum flat of $\frac{1}{8} \times p$.

The third consideration is important. The whole subject has three natural divisions—those relating respectively to the product, to production tools, and to gaging. Of these the product is primary, and is the only one considered in this report. Its limits should be set as generously as possible, as in this case, thus leaving room for tool standardization, as for tap drills and taps, to be made independently within the product limits without disturbing the primary standard. The outside diameter and form of crest of the tap tooth may thus be varied within limits to give the best possible conditions, without changing the tables given above. See (e) below.

Practically the same observations apply to the minimum minor diameter of the screw, which is limited by setting the minimum width of flat at $\frac{1}{4} \times p$. See Note (a) in the accompanying tables.

(d) *Length of Engagement*—The tolerances herein determined are based on a length of engagement not to exceed the nominal diameter of the thread. Where greater lengths of engagement are required a corresponding increase in the accuracy of lead and thread form is necessary, which may be obtained by the provision or selection of more accurate threading tools, and the use of longer "Go" gages.

(e) *Rounded Root Forms*—The crest clearances allowed are such as to permit rounded root forms in both nut and screw. These may be formed either by tools purposely rounded or rounded as a result of wear in use. For the limits of this permissible rounding see Section IV, paragraphs 6 and 7.

The subject of the length of engagement, and its relations to pitch diameter, lead and angle tolerances, will be described later.

Table III—Coarse-Thread Series—American (National) Standard Screw Threads—Nos. 1 to 12

Figures taken from the Screw Thread Standard Report of the American Engineering Standards Committee

				No. 1-64	No. 2-56	No. 3-48	No. 4-40	No. 5-40	No. 6-32	No. 8-32	No. 10-24	No. 12-24	
(1)	Size and threads, per inch												(1)
	SCREWS AND BOLTS												
(2)	All fits	Major diam.	Max. (Basic)	0.0730	0.0860	0.0990	0.1120	0.1250	0.1380	0.1640	0.1900	0.2160	(2)
(3)	All fits	Major diam.	Min.	0.0692	0.0820	0.0946	0.1072	0.1202	0.1326	0.1586	0.1834	0.2094	(3)
(4)	All fits	Major diam.	Tol.	0.0038	0.0040	0.0044	0.0048	0.0048	0.0054	0.0054	0.0066	0.0066	(4)
(5)	All fits	Minor diam.	Max. (Note a)	0.0538	0.0641	0.0734	0.0813	0.0943	0.0997	0.1257	0.1389	0.1649	(5)
(6)	Class 2—Free fit	Pitch diam.	Max. (Basic)	0.0629	0.0744	0.0855	0.0958	0.1088	0.1177	0.1437	0.1629	0.1889	(6)
(7)	Class 2—Free fit	Pitch diam.	Min.	0.0610	0.0724	0.0833	0.0934	0.1064	0.1150	0.1410	0.1596	0.1856	(7)
(8)	Class 2—Free fit	Pitch diam.	Tol. (Note b)	0.0019	0.0020	0.0022	0.0024	0.0024	0.0027	0.0027	0.0033	0.0033	(8)
(9)	Class 3—Medium fit	Pitch diam.	Max. (Basic)	0.0629	0.0744	0.0855	0.0958	0.1088	0.1177	0.1437	0.1629	0.1889	(9)
(10)	Class 3—Medium fit	Pitch diam.	Min.	0.0615	0.0729	0.0839	0.0941	0.1071	0.1158	0.1418	0.1605	0.1865	(10)
(11)	Class 3—Medium fit	Pitch diam.	Tol. (Note b)	0.0014	0.0015	0.0016	0.0017	0.0017	0.0019	0.0019	0.0024	0.0024	(11)
(12)	Class 4—Close fit	Pitch diam.	Max.	0.0630	0.0746	0.0857	0.0960	0.1090	0.1179	0.1439	0.1632	0.1892	(12)
(13)	Class 4—Close fit	Pitch diam.	Min.	0.0623	0.0739	0.0849	0.0951	0.1081	0.1169	0.1429	0.1620	0.1880	(13)
(14)	Class 4—Close fit	Pitch diam.	Tol. (Note b)	0.0007	0.0007	0.0008	0.0009	0.0009	0.0010	0.0010	0.0012	0.0012	(14)
	NUTS AND TAPPED HOLES												
(15)	All fits	Major diam.	Min. (Basic) (Note c)	0.0730	0.0860	0.0990	0.1120	0.1250	0.1380	0.1640	0.1900	0.2160	(15)
(16)	All fits	Minor diam.	Max.	0.0578	0.0686	0.0787	0.0876	0.1006	0.1076	0.1336	0.1494	0.1754	(16)
(17)	All fits	Minor diam.	Min.	0.0561	0.0667	0.0764	0.0849	0.0979	0.1042	0.1302	0.1449	0.1709	(17)
(18)	All fits	Minor diam.	Tol.	0.0017	0.0019	0.0023	0.0027	0.0027	0.0034	0.0034	0.0045	0.0045	(18)
(19)	All fits	Pitch diam.	Min. (Basic)	0.0629	0.0744	0.0855	0.0958	0.1088	0.1177	0.1437	0.1629	0.1889	(19)
(20)	Class 1—Loose fit	Pitch diam.	Max.	0.0655	0.0772	0.0886	0.0992	0.1122	0.1215	0.1475	0.1675	0.1935	(20)
(21)	Class 1—Loose fit	Pitch diam.	Tol. (Note b)	0.0026	0.0028	0.0031	0.0034	0.0034	0.0038	0.0038	0.0046	0.0046	(21)
(22)	Class 2—Free fit	Pitch diam.	Max.	0.0648	0.0764	0.0877	0.0982	0.1112	0.1204	0.1464	0.1662	0.1922	(22)
(23)	Class 2—Free fit	Pitch diam.	Tol. (Note b)	0.0019	0.0020	0.0022	0.0024	0.0024	0.0027	0.0027	0.0033	0.0033	(23)
(24)	Class 3—Medium fit	Pitch diam.	Max.	0.0643	0.0759	0.0871	0.0975	0.1105	0.1196	0.1456	0.1653	0.1913	(24)
(25)	Class 3—Medium fit	Pitch diam.	Tol. (Note b)	0.0014	0.0015	0.0016	0.0017	0.0017	0.0019	0.0019	0.0024	0.0024	(25)
	THREAD FORM												
(28)	Depth of thread			0.01015	0.01160	0.01353	0.01624	0.01624	0.02030	0.02030	0.02706	0.02706	(28)
(29)	Pitch			0.01562	0.01786	0.02083	0.02500	0.02500	0.03125	0.03125	0.04167	0.04167	(29)
(30)	Width of flat = $\frac{1}{8}$ x pitch (Basic) (Note a)			0.00195	0.00223	0.00260	0.00312	0.00312	0.00391	0.00391	0.00521	0.00521	(30)
(31)	Width of flat = $\frac{1}{24}$ x pitch (Note c)			0.00065	0.00074	0.00087	0.00104	0.00104	0.00130	0.00130	0.00174	0.00174	(31)
(32)	Helix angle at basic pitch diam.			4° 31′	4° 22′	4° 26′	4° 45′	4° 11′	4° 50′	3° 58′	4° 40′	4° 1′	(32)
	LEAD AND FORM TOLERANCES												
(33)	Class 1—Loose fit	Lead tolerance	(Note b)	0.0008	0.0008	0.0009	0.0010	0.0010	0.0011	0.0011	0.0013	0.0013	(33)
(34)	Class 1—Loose fit	Tol. in ½ angle	(Note b)	3° 32′	3° 18′	3° 7′	2° 50′	2° 50′	2° 30′	2° 30′	2° 15′	2° 15′	(34)
(35)	Class 2—Free fit	Lead tolerance	(Note b)	0.0005	0.0006	0.0006	0.0007	0.0007	0.0008	0.0008	0.0009	0.0009	(35)
(36)	Class 2—Free fit	Tol. in ½ angle	(Note b)	2° 23′	2° 11′	2° 4′	1° 52′	1° 52′	1° 41′	1° 41′	1° 32′	1° 32′	(36)
(37)	Class 3—Medium fit	Lead tolerance	(Note b)	0.0004	0.0004	0.0005	0.0005	0.0005	0.0005	0.0005	0.0007	0.0007	(37)
(38)	Class 3—Medium fit	Tol. in ½ angle	(Note b)	1° 49′	1° 41′	1° 32′	1° 21′	1° 21′	1° 12′	1° 12′	1° 8′	1° 8′	(38)
(39)	Class 4—Close fit	Lead tolerance	(Note b)	0.0002	0.0002	0.0002	0.0003	0.0003	0.0003	0.0003	0.0003	0.0003	(39)
(40)	Class 4—Close fit	Tol. in ½ angle	(Note b)	52′	46′	45′	42′	42′	37′	37′	33′	33′	(40)

(Note a)—Dimensions given are figured to the intersection of the worn tool arc with a center line through crest and root. Minimum flat at root equals $\frac{1}{8} \times p$.

(Note b)—The tolerances specified for pitch diameter are cumulative, and include all errors of lead and angle. The full tolerance on the pitch diameter is therefore not available unless the lead and angle of the thread are perfect. Lines 35 to 40 inclusive give, for information, the error in lead (per length of thread engaged) and in angle, which can each be compensated for by half the tolerance on the pitch diameter shown in lines 8, 11, 14, 21, 23, 25 and 27. If lead and angle error both exist to the amount tabulated, the pitch diameter of a bolt, for example, must be reduced by the full tolerance or it will not enter a basic nut or gage. If no lead error existed on such a bolt, the angle error could be twice that given, and conversely; but these extremes are not desirable. See Appendix (B).

(Note c)—Dimensions given are allowable only with a tap having theoretically sharp corners. The threaded hole must not reject a correct basic "Go" gage by interference with the rounded roots due to a worn tap. Mininmum flat at the root equals $\frac{1}{24} \times p$.

Table IV—Fine-Thread Series—American (National) Standard Screw Threads—¼ to 1½ Inches

Figures taken from the Screw Thread Standard Report of the American Engineering Standards Committee

					¼-28	5/16-24	⅜-24	7/16-20	½-20	9/16-18	⅝-18	¾-16	⅞-14	1-14	1⅛-12	1¼-12	1⅜-12	
(1)	Size and threads, per inch																	(1)
	SCREWS AND BOLTS																	
(2)	All fits	Major diam.	Max. (Basic)		0.2500	0.3125	0.3750	0.4375	0.5000	0.5625	0.6250	0.7500	0.8750	1.0000	1.1250	1.2500	1.5000	(2)
(3)	All fits	Major diam.	Min.		0.2438	0.3059	0.3684	0.4303	0.4928	0.5543	0.6168	0.7410	0.8652	0.9902	1.1138	1.2388	1.4888	(3)
(4)	All fits	Major diam.	Tol.		0.0062	0.0066	0.0066	0.0072	0.0072	0.0082	0.0082	0.0090	0.0098	0.0098	0.0112	0.0112	0.0112	(4)
(5)	All fits	Minor diam.	Max. (Note a)		0.2062	0.2614	0.3239	0.3762	0.4387	0.4943	0.5568	0.6733	0.7874	0.9124	1.0228	1.1478	1.3978	(5)
(6)	Class 2—Free fit	Pitch diam.	Max. (Basic)		0.2268	0.2854	0.3479	0.4050	0.4675	0.5264	0.5889	0.7094	0.8286	0.9536	1.0709	1.1959	1.4459	(6)
(7)	Class 2—Free fit	Pitch diam.	Min.		0.2237	0.2821	0.3446	0.4014	0.4639	0.5223	0.5848	0.7049	0.8237	0.9487	1.0653	1.1903	1.4403	(7)
(8)	Class 2—Free fit	Pitch diam.	Tol. (Note b)		0.0031	0.0033	0.0033	0.0036	0.0036	0.0041	0.0041	0.0045	0.0049	0.0049	0.0056	0.0056	0.0056	(8)
(9)	Class 3—Medium fit	Pitch diam.	Max. (Basic)		0.2268	0.2854	0.3479	0.4050	0.4675	0.5264	0.5889	0.7094	0.8286	0.9536	1.0709	1.1959	1.4459	(9)
(10)	Class 3—Medium fit	Pitch diam.	Min.		0.2246	0.2830	0.3455	0.4024	0.4649	0.5234	0.5859	0.7062	0.8250	0.9500	1.0669	1.1919	1.4419	(10)
(11)	Class 3—Medium fit	Pitch diam.	Tol. (Note b)		0.0022	0.0024	0.0024	0.0026	0.0026	0.0030	0.0030	0.0032	0.0036	0.0036	0.0040	0.0040	0.0040	(11)
(12)	Class 4—Close fit	Pitch diam.	Max.		0.2270	0.2857	0.3482	0.4053	0.4678	0.5267	0.5892	0.7098	0.8290	0.9540	1.0714	1.1964	1.4464	(12)
(13)	Class 4—Close fit	Pitch diam.	Min.		0.2259	0.2845	0.3470	0.4040	0.4665	0.5252	0.5877	0.7082	0.8272	0.9522	1.0694	1.1944	1.4444	(13)
(14)	Class 4—Close fit	Pitch diam.	Tol. (Note b)		0.0011	0.0012	0.0012	0.0013	0.0013	0.0015	0.0015	0.0016	0.0018	0.0018	0.0020	0.0020	0.0020	(14)
	NUTS AND TAPPED HOLES																	
(15)	All fits	Major diam.	Min. (Basic) (Note c)		0.2500	0.3125	0.3750	0.4375	0.5000	0.5625	0.6250	0.7500	0.8750	1.0000	1.1250	1.2500	1.5000	(15)
(16)	All fits	Minor diam.	Max.		0.2152	0.2719	0.3344	0.3888	0.4513	0.5084	0.5709	0.6891	0.8054	0.9304	1.0438	1.1688	1.4188	(16)
(17)	All fits	Minor diam.	Min.		0.2113	0.2674	0.3299	0.3834	0.4459	0.5024	0.5649	0.6823	0.7977	0.9227	1.0348	1.1598	1.4098	(17)
(18)	All fits	Minor diam.	Tol.		0.0039	0.0045	0.0045	0.0054	0.0054	0.0060	0.0060	0.0068	0.0077	0.0077	0.0090	0.0090	0.0090	(18)
(19)	All fits	Pitch diam.	Min. (Basic)		0.2268	0.2854	0.3479	0.4050	0.4675	0.5264	0.5889	0.7094	0.8286	0.9536	1.0709	1.1959	1.4459	(19)
(22)	Class 2—Free fit	Pitch diam.	Max.		0.2299	0.2887	0.3512	0.4086	0.4711	0.5305	0.5930	0.7139	0.8335	0.9585	1.0765	1.2015	1.4515	(22)
(23)	Class 2—Free fit	Pitch diam.	Tol. (Note b)		0.0031	0.0033	0.0033	0.0036	0.0036	0.0041	0.0041	0.0045	0.0049	0.0049	0.0056	0.0056	0.0056	(23)
(24)	Class 3—Medium fit	Pitch diam.	Max.		0.2290	0.2878	0.3503	0.4076	0.4701	0.5294	0.5919	0.7126	0.8322	0.9572	1.0749	1.1999	1.4499	(24)
(25)	Class 3—Medium fit	Pitch diam.	Tol. (Note b)		0.0022	0.0024	0.0024	0.0026	0.0026	0.0030	0.0030	0.0032	0.0036	0.0036	0.0040	0.0040	0.0040	(25)
(26)	Class 4—Close fit	Pitch diam.	Max.		0.2279	0.2866	0.3491	0.4063	0.4688	0.5279	0.5904	0.7110	0.8304	0.9554	1.0729	1.1979	1.4479	(26)
(27)	Class 4—Close fit	Pitch diam.	Tol. (Note b)		0.0011	0.0012	0.0012	0.0013	0.0013	0.0015	0.0015	0.0016	0.0018	0.0018	0.0020	0.0020	0.0020	(27)
	THREAD FORM																	
(28)	Depth of thread				0.02319	0.02706	0.02706	0.03248	0.03248	0.03608	0.03608	0.04060	0.04640	0.04640	0.05413	0.05413	0.05413	(28)
(29)	Pitch				0.03571	0.04167	0.04167	0.05000	0.05000	0.05556	0.05556	0.06250	0.07143	0.07143	0.08333	0.08333	0.08333	(29)
(30)	Basic width of flat = ⅛ x pitch (Note a)				0.00446	0.00521	0.00521	0.00625	0.00625	0.00694	0.00694	0.00781	0.00893	0.00893	0.01042	0.01042	0.01042	(30)
(31)	Min. width of flat = 1/24 x pitch (Note c)				0.00149	0.00174	0.00174	0.00208	0.00208	0.00231	0.00231	0.00260	0.00298	0.00298	0.00347	0.00347	0.00347	(31)
(32)	Helix angle at basic pitch diam.				2° 52′	2° 40′	2° 11′	2° 15′	1° 57′	1° 55′	1° 43′	1° 36′	1° 34′	1° 22′	1° 25′	1° 16′	1° 3′	(32)
	LEAD AND FORM TOLERANCES																	
(35)	Class 2—Free fit	Lead tolerance	(Note b)		0.0009	0.0009	0.0009	0.0010	0.0010	0.0012	0.0012	0.0013	0.0014	0.0014	0.0016	0.0016	0.0016	(35)
(36)	Class 2—Free fit	Tol. in ½ angle	(Note b)		1° 45′	1° 32′	1° 32′	1° 24′	1° 24′	1° 26′	1° 26′	1° 24′	1° 20′	1° 20′	1° 18′	1° 18′	1° 18′	(36)
(37)	Class 3—Medium fit	Lead tolerance	(Note b)		0.0006	0.0007	0.0007	0.0008	0.0008	0.0009	0.0009	0.0009	0.0010	0.0010	0.0012	0.0012	0.0012	(37)
(38)	Class 3—Medium fit	Tol. in ½ angle	(Note b)		1° 13′	1° 8′	1° 8′	1° 2′	1° 2′	1° 4′	1° 4′	1° 1′	1° 0′	1° 0′	57′	57′	57′	(38)
(39)	Class 4—Close fit	Lead tolerance	(Note b)		0.0003	0.0003	0.0003	0.0004	0.0004	0.0004	0.0004	0.0005	0.0005	0.0005	0.0006	0.0006	0.0006	(39)
(40)	Class 4—Close fit	Tol. in ½ angle	(Note b)		36′	33′	33′	30′	30′	30′	30′	30′	29′	29′	28′	28′	28′	(40)

(Note a)—Dimensions given are figured to the intersection of the worn tool arc with a center line through crest and root. Minimum flat at root equals $\frac{1}{8} \times p$.

(Note b)—The tolerances specified for pitch diameter are cumulative, and include all errors of lead and angle. The full tolerance on the pitch diameter is therefore not available unless the lead and angle of the thread are perfect. Lines 35 to 40 inclusive give, for information, the error in lead (per length of thread engaged) and in angle, which can each be compensated for by half the tolerance on the pitch diameter shown in lines 8, 11, 14, 21, 23, 25 and 27. If lead and angle error both exist to the amount tabulated, the pitch diameter of a bolt, for example, must be reduced by the full tolerance or it will not enter a basic nut or gage. If no lead error existed on such a bolt, the angle error could be twice that given, and conversely; but these extremes are not desirable. See Appendix (B).

(Note c)—Dimensions given are allowable only with a tap having theoretically sharp corners. The threaded hole must not reject a correct basic "Go" gage by interference with the rounded roots due to a worn tap. Minimum flat at the root equals $\frac{1}{24} \times p$.

Table V—Fine-Thread Series—American (National) Standard Screw Threads—Nos. 0 to 12

Figures taken from the Screw Thread Standard Report of the American Engineering Standards Committee

				No. 0-80	No. 1-72	No. 2-64	No. 3-56	No. 4-48	No. 5-44	No. 6-40	No. 8-36	No. 10-32	No. 12-28	
(1)	Size and threads, per inch													(1)
	SCREWS AND BOLTS													
(2)	All fits	Major diam.	Max. (Basic)	0.0600	0.0730	0.0860	0.0990	0.1120	0.1250	0.1380	0.1640	0.1900	0.2160	(2)
(3)	All fits	Major diam.	Min.	0.0566	0.0694	0.0822	0.0950	0.1076	0.1204	0.1332	0.1590	0.1846	0.2098	(3)
(4)	All fits	Major diam.	Tol.	0.0034	0.0036	0.0038	0.0040	0.0044	0.0046	0.0048	0.0050	0.0054	0.0062	(4)
(5)	All fits	Minor diam.	Max. (Note a)	0.0447	0.0560	0.0668	0.0771	0.0864	0.0971	0.1073	0.1299	0.1517	0.1722	(5)
(6)	Class 2—Free fit	Pitch diam.	Max. (Basic)	0.0519	0.0640	0.0759	0.0874	0.0985	0.1102	0.1218	0.1460	0.1697	0.1928	(6)
(7)	Class 2—Free fit	Pitch diam.	Min.	0.0502	0.0622	0.0740	0.0854	0.0963	0.1079	0.1194	0.1435	0.1670	0.1897	(7)
(8)	Class 2—Free fit	Pitch diam.	Tol. (Note b)	0.0017	0.0018	0.0019	0.0020	0.0022	0.0023	0.0024	0.0025	0.0027	0.0031	(8)
(9)	Class 3—Medium fit	Pitch diam.	Max. (Basic)	0.0519	0.0640	0.0759	0.0874	0.0985	0.1102	0.1218	0.1460	0.1697	0.1928	(9)
(10)	Class 3—Medium fit	Pitch diam.	Min.	0.0506	0.0627	0.0745	0.0859	0.0969	0.1086	0.1201	0.1442	0.1678	0.1906	(10)
(11)	Class 3—Medium fit	Pitch diam.	Tol. (Note b)	0.0013	0.0013	0.0014	0.0015	0.0016	0.0016	0.0017	0.0018	0.0019	0.0022	(11)
(12)	Class 4—Close fit	Pitch diam.	Max.	0.0520	0.0641	0.0760	0.0876	0.0987	0.1104	0.1220	0.1462	0.1699	0.1930	(12)
(13)	Class 4—Close fit	Pitch diam.	Min.	0.0514	0.0634	0.0753	0.0869	0.0979	0.1096	0.1211	0.1453	0.1689	0.1919	(13)
(14)	Class 4—Close fit	Pitch diam.	Tol. (Note b)	0.0006	0.0007	0.0007	0.0007	0.0008	0.0008	0.0009	0.0009	0.0010	0.0011	(14)
	NUTS AND TAPPED HOLES													
(15)	All fits	Major diam.	Min. (Basic) (Note c)	0.0600	0.0730	0.0860	0.0990	0.1120	0.1250	0.1380	0.1640	0.1900	0.2160	(15)
(16)	All fits	Minor diam.	Max.	0.0478	0.0595	0.0708	0.0816	0.0917	0.1029	0.1136	0.1369	0.1596	0.1812	(16)
(17)	All fits	Minor diam.	Min.	0.0465	0.0580	0.0691	0.0797	0.0894	0.1004	0.1109	0.1339	0.1562	0.1773	(17)
(18)	All fits	Minor diam.	Tol.	0.0013	0.0015	0.0017	0.0019	0.0023	0.0025	0.0027	0.0030	0.0034	0.0039	(18)
(19)	All fits	Pitch diam.	Min. (Basic)	0.0519	0.0640	0.0759	0.0874	0.0985	0.1102	0.1218	0.1460	0.1697	0.1928	(19)
(20)	Class 1—Loose fit	Pitch diam.	Max.	0.0543	0.0665	0.0785	0.0902	0.1016	0.1134	0.1252	0.1496	0.1735	0.1971	(20)
(21)	Class 1—Loose fit	Pitch diam.	Tol. (Note b)	0.0024	0.0025	0.0026	0.0028	0.0031	0.0032	0.0034	0.0036	0.0038	0.0043	(21)
(22)	Class 2—Free fit	Pitch diam.	Max.	0.0536	0.0658	0.0778	0.0894	0.1007	0.1125	0.1242	0.1485	0.1724	0.1959	(22)
(23)	Class 2—Free fit	Pitch diam.	Tol. (Note b)	0.0017	0.0018	0.0019	0.0020	0.0022	0.0023	0.0024	0.0025	0.0027	0.0031	(23)
(24)	Class 3—Medium fit	Pitch diam.	Max.	0.0532	0.0653	0.0773	0.0889	0.1001	0.1118	0.1235	0.1478	0.1716	1.1950	(24)
(25)	Class 3—Medium fit	Pitch diam.	Tol. (Note b)	0.0013	0.0013	0.0014	0.0015	0.0016	0.0016	0.0017	0.0018	0.0019	0.0022	(25)
	THREAD FORM													
(28)	Depth of thread			0.00812	0.00902	0.01015	0.01160	0.01353	0.01476	0.01624	0.01804	0.02030	0.02320	(28)
(29)	Pitch			0.01250	0.01389	0.01562	0.01786	0.02083	0.02273	0.02500	0.02778	0.03125	0.03571	(29)
(30)	Width of flat = $\frac{1}{8}$ x pitch (Basic) (Note a)			0.00156	0.00174	0.00195	0.00223	0.00260	0.00284	0.00312	0.00347	0.00391	0.00446	(30)
(31)	Width of flat = 1-24 x pitch (Note c)			0.00052	0.00058	0.00065	0.00074	0.00087	0.00095	0.00104	0.00116	0.00130	0.00149	(31)
(32)	Helix angle at basic pitch diam.			4° 27′	3° 57′	3° 54′	3° 44′	3° 51′	3° 23′	3° 45′	3° 28′	3° 21′	3° 25′	(32)
	LEAD AND FORM TOLERANCES													
(33)	Class 1—Loose fit	Lead tolerance (Note b)		0.0007	0.0007	0.0008	0.0008	0.0009	0.0009	0.0010	0.0010	0.0011	0.0012	(33)
(34)	Class 1—Loose fit	Tol. in $\frac{1}{2}$ angle (Note b)		4° 9′	3° 51′	3° 32′	3° 18′	3° 7′	2° 56′	2° 50′	2° 41′	2° 30′	2° 29′	(34)
(35)	Class 2—Free fit	Lead tolerance (Note b)		0.0005	0.0005	0.0005	0.0006	0.0006	0.0007	0.0007	0.0007	0.0008	0.0009	(35)
(36)	Class 2—Free fit	Tol. in $\frac{1}{2}$ angle (Note b)		2° 50′	2° 41′	2° 23′	2° 11′	2° 4′	2° 3′	1° 52′	1° 49′	1° 41′	1° 45′	(36)
(37)	Class 3—Medium fit	Lead tolerance (Note b)		0.0004	0.0004	0.0004	0.0004	0.0005	0.0005	0.0005	0.0005	0.0005	0.0006	(37)
(38)	Class 3—Medium fit	Tol. in $\frac{1}{2}$ angle (Note b)		2° 7′	1° 54′	1° 49′	1° 41′	1° 32′	1° 24′	1° 21′	1° 17′	1° 12′	1° 13′	(38)
(39)	Class 4—Close fit	Lead tolerance (Note b)		0.0002	0.0002	0.0002	0.0002	0.0002	0.0002	0.0003	0.0003	0.0003	0.0003	(39)
(40)	Class 4—Close fit	Tol. in $\frac{1}{2}$ angle (Note b)		56′	54′	52′	46′	45′	41′	40′	38′	37′	36′	(40)

(Note a)—Dimensions given are figured to the intersection of the worn tool arc with a center line through crest and root. Minimum flat at root equals $\frac{1}{8} \times p$.

(Note b)—The tolerances specified for pitch diameter are cumulative, and include all errors of lead and angle. The full tolerance on the pitch diameter is therefore not available unless the lead and angle of the thread are perfect. Lines 35 to 40 inclusive give, for information, the error in lead (per length of thread engaged) and in angle, which can each be compensated for by half the tolerance on the pitch diameter shown in lines 8, 11, 14, 21, 23, 25 and 27. If lead and angle error both exist to the amount tabulated, the pitch diameter of a bolt, for example, must be reduced by the full tolerance or it will not enter a basic nut or gage. If no lead error existed on such a bolt, the angle error could be twice that given, and conversely; but these extremes are not desirable. See Appendix (B).

(Note c)—Dimensions given are allowable only with a tap having theoretically sharp corners. The threaded hole must not reject a correct basic "Go" gage by interference with the rounded roots due to a worn tap. Minimum flat at the root equals $\frac{1}{14} \times p$.

It Pays to Replace—

How a Shop Saved by Replacing Old Shop Equipment with New Equipment

These articles won honorable mention

By E. T. Spidy
Asst. Supt. Dominion Engineering Works, Ltd., Montreal, Canada

OUR machine shop is equipped with a regular complement of machine tools, together with some special machines and our line of manufacture is hydraulic turbines, paper mill machinery and special machines of various kinds.

In connection with paper making machinery there are large numbers of rolls made from iron, brass or copper piping and a large quantity of long shafts, on all of which there is an operation of straightening to be done before the pipe can be turned to make a roll, or before a forging or bar can be turned so that it will "clean up."

Straightening bars or pipes is an operation that is nearly always underestimated by estimators, unless they are experienced on that particular work. An experienced man, however, knows that while pipe is ordered "straight" by the purchasing agent, he gets what would be straight enough for a pipe line, but when he requires it to make a roll it has to be straightened before being turned. Likewise long forged shafts and long bar stock, while not to be compared with pipe, also have to be straightened. The usual method in the case of a bar is to set it between lathe centers, and rotate it, using a piece of chalk to mark the high spots. Next it is taken to the straightening press, the lower blocks adjusted the correct distance apart and the pressure applied at the chalk mark or where the mark indicates to be the correct point. The press in our case was of the hand-operated screw type having four posts and mounted on wheels that moved on two long I-beams set in concrete. Then the gang had to take the bar back to the lathe and go through the process again and again until it was straight.

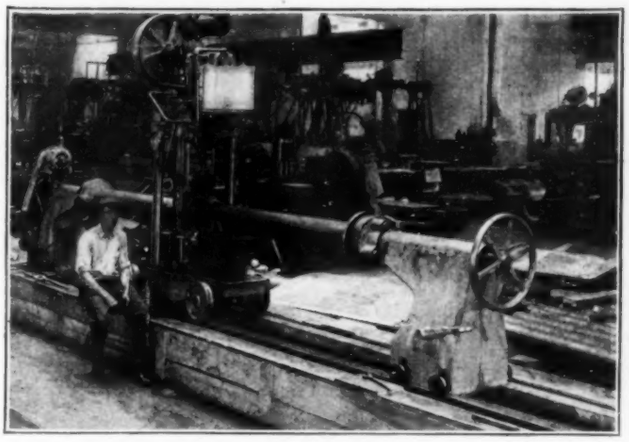
Straightening Pipe

Pipe, which runs from eight to twenty-two feet in lengths and in diameters from 6 to 12 in., was set up in an old lathe close to the press and rotated. One end of the pipe was held in the chuck and the other on a large cone center. The procedure was the same as with the bars and two years' records showed us that each 8- or 10-in. pipe took an average of from 12 to 18 hr. to straighten. Over 500 pieces of pipe were done this way.

I should also mention that other methods are used in various endeavors to speed up this work. When we get short kinks, the oil torch is used to heat up the job to help the press. Again on long bends, that is, when the job was out in one plane from end to end, a jack would be placed on the bed of the lathe and the job strained. Then again the use of a jack, and then peening to stretch one side was often resorted to.

Who has not done what has just been described hundreds of times? It is an art and the skill of the operator means a lot. We learned long ago to hold on to "so and so" because he could straighten pipe quicker than anybody in these parts.

With all this we were not satisfied. We had so much of this work that the job set us hunting. We tried to get straighter pipe and so on, but found that no manufacturer would or could give it to us. Then we found out that Logeman Bros. Co., Milwaukee, Wis., made a specialty of hydraulic presses for just such requirements as ours.



LOGEMAN HYDRAULIC STRAIGHTENING PRESS

One of these presses was purchased and since its installation, our trouble is not only ended but the investment has proved an extraordinarily good one for our company, as 2 to 3 hr. is the present time for straightening a length of 8- or 10-in. pipe.

The new press is designed to handle straightening in one setting completely, and with a minimum of effort. It is now a one-man operation, whereas at least one helper and sometimes two, had to be employed with a machinist under the old way. Hydraulic power is substituted for handpower, and central electrical control of all operations is an outstanding feature. The illustration shows this press set up in our shop. We installed it on the same I-beams that the old machine was on. The operator travels the press carriage to one end while the pipe is lowered by the crane in between the cone centers. He then moves the tailstock into position by means of a handwheel. The pipe is rotated by a motor on the headstock of the machine, controlled by an electric switch on the press carriage within reach from the operator's seat. The hydraulic-press motor is situated on the press carriage, as is the pump, and is also controlled by a handy switch. One valve controls

the press motions. The cone centers have flexible connection to their respective centers which permits of movement up or down when pressure is applied to any part of the work. They automatically re-center themselves when the pressure is released.

The savings effected are in approximately the same ratio for all sizes of work. For one 12-in. pipe, 16 ft. long, that is ordered "commercially straight" and is what we would call "good average straight" the comparison shows as follows:

	Old Machine	New Machine
Time per pipe	12 to 18 hr.—say 12 hr.	2 to 3 hr.—say 3
No. men	2 (sometimes 3)—say 2	1
Rate per hour	1 mach. 1 helper—gang $1. per hr.	1 at 60c. per hr.
Labor cost per pipe, net	$12	$1.80

During the first six months the new press was in operation, we straightened 326 pieces of pipe, which represented a total saving of $3,325 in net labor and is much more than the price of the press. In this cost comparison is not included miscellaneous work on which saving has also been made, neither has power consumption, etc., been taken into consideration, because it would only add to the savings shown.

In the above statement it will be noticed that by employing averages, the saving shown could have been made larger. I am confident it is larger, but the result is satisfying enough to show the value of studying operations that are not always outstanding enough in themselves with respect to old machinery of accepted type, as compared with results made possible by machinery designed to meet modern needs.

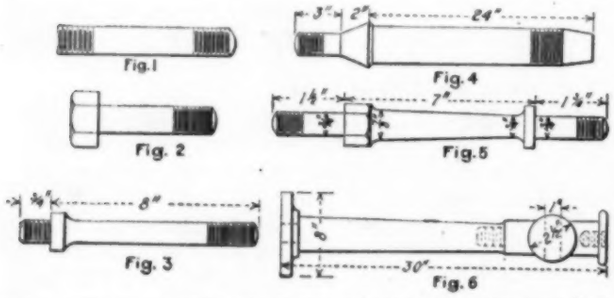
BY H. MAPLETHORPE

Foreman, Hedleys, Ltd., Engineers, West Bromwich, England

TO TELL the whole story of how a shop saved by replacing old machine tools with new, would take a long time, and I will therefore only give a birds's-eye view of my experience.

A few years ago, at the shops of Robey & Co., Lincoln, a department equipped with automatics was added and I was placed in charge. The equipment comprised, Cleveland, Hartford and Herbert automatics; Warner & Swasey, Bardons & Oliver and Potter & Johnson capstan lathes; a Landis grinding machine and some boring mills.

Studs, such as are shown in Fig. 1, were made on a



FIGS. 1 TO 6—PARTS MADE ON AUTOMATIC AND TURRET MACHINES AT A GREAT SAVING

1¼-in. Cleveland automatic in lots of 10,000 at a set-up. Previously, they had been made in three gross lots on a Smith & Coventry capstan lathe.

Bolts, as shown in Fig. 2, were used in large quantities and in various sizes and were made in a 1¾-in. Herbert automatic.

Studs for relief valves, as in Fig. 3, were made in a Hartford automatic, which often ran two or three weeks and made 10,000 to 15,000 pieces at a set-up. Previously these studs had been made from forgings and turned between centers in an engine lathe. When made in an automatic, the cost was less than that of the forgings, and the production was much greater than in the lathe.

Piston rods for a high-speed steam engine, Fig. 4, were used in large lots and had previously been made from forgings and machined between centers in an engine lathe. I undertook the making of them from bar steel on a 2½-in. Herbert hexagon turret lathe, with the result that there was less waste of material and the cost was less than that of the forgings. The piston rods, after they came from the turret lathe, were finished by grinding in a Landis machine, making a far superior finish than was possible by the method previously used.

Column studs for boiler stop-valves, as represented by Fig. 5, had previously been made from forgings and turned in an engine lathe. When this work was given to a 1¾-in. Herbert automatic and made from the bar, the time was 11½ min. each.

STANDARDS FOR HANDRAILS

The part, shown in Fig. 6, is standard for such hand rails as are usually placed around engines. These standards had formerly been made from forgings costing 17s. 6d. for the forging alone. Afterwards they were turned out by a Wollsey turret lathe, in the built-up fashion shown in the sketch, at an increase of 250 per cent in production.

Another job was the making of governor balls up to 2 in. in diameter, and formerly made of cast iron. Naturally, they varied considerably in density. Afterwards they were made from the bar in a Herbert automatic in 9½ min. each and, besides weighing alike, were better finished.

In the boiler shop, a hydraulic flanging press saved seven heats in flanging front plates of boilers of the locomotive type.

In the foundry, molding machines increased the output per man 600 per cent.

In the smithy, the drop hammer increased the output up to 1,000 per cent and produced far better finished articles.

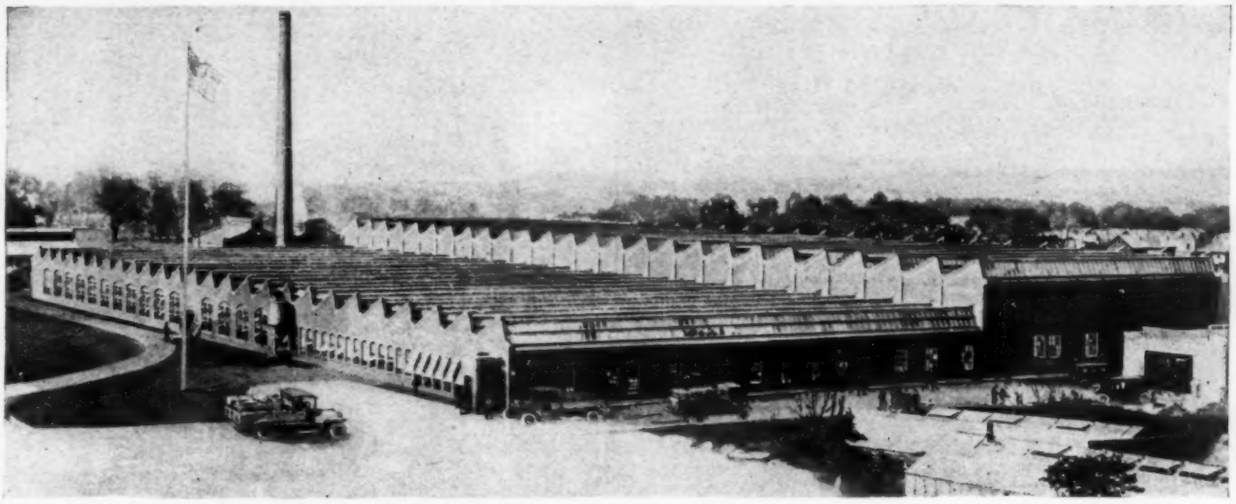
During the world war, the output of bearing bushings for the Sunbeam aero engines was doubled at Hedleys by the introduction of Ryerson, Willard and Mullener turret lathes, and work within 0.0005 in. limit was produced.

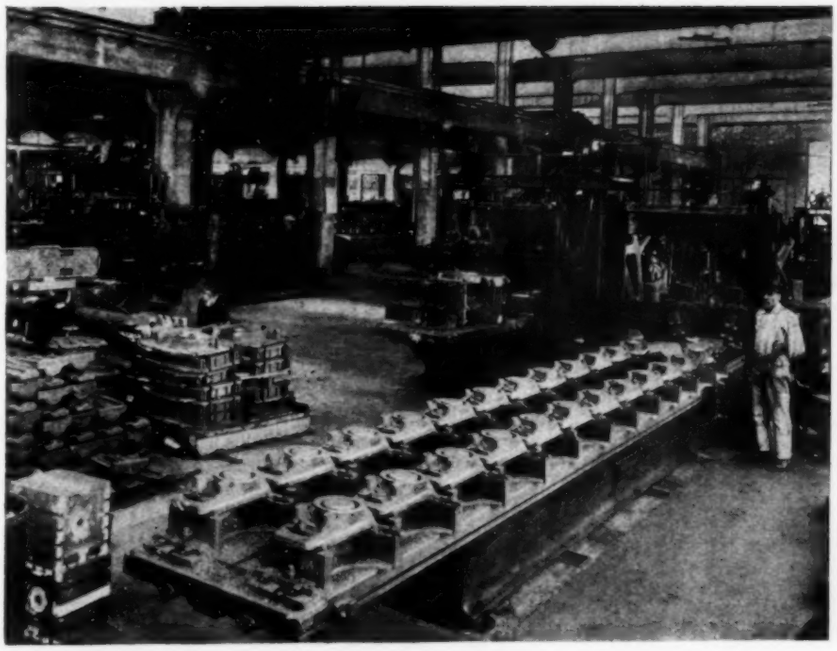
Performance of an English Tool Steel

The following data are reported from the Bullard Machine Tool Co. concerning the performance of Van Asten "Supra" steel made in England.

A ½-in. twist drill ran for one hour on 0.40 carbon steel at 640 r.p.m. with 0.043 in. feed. Penetration was 27 in. per minute. The drill was flooded with oil.

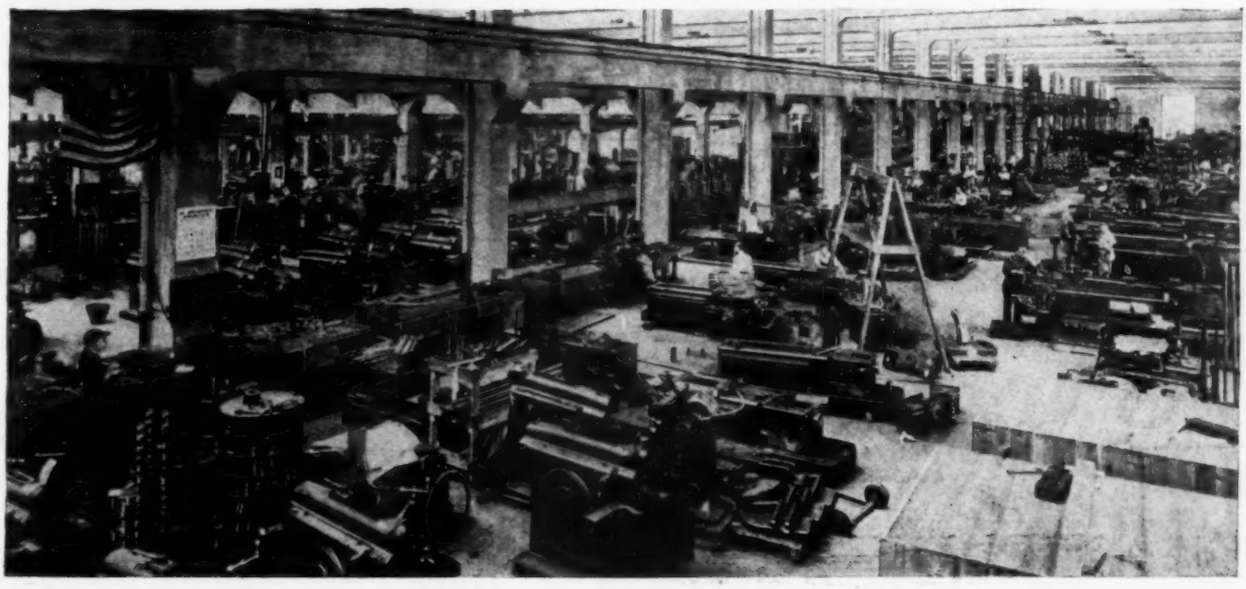
A 1x1¼-in. tool used in the side head of a Bullard 24-in. vertical turret lathe, machining Carpenter 5-317 chrome nickel steel, with length of cut 2¼ in., depth of cut ⅝ in., feed 0.014 in. per minute, work turning at 40 r.p.m., made a reduction from 4¾ to 3½ in. in diameter with an average of thirty-one pieces per grind as against eight to ten pieces per grind with the steels formerly used.

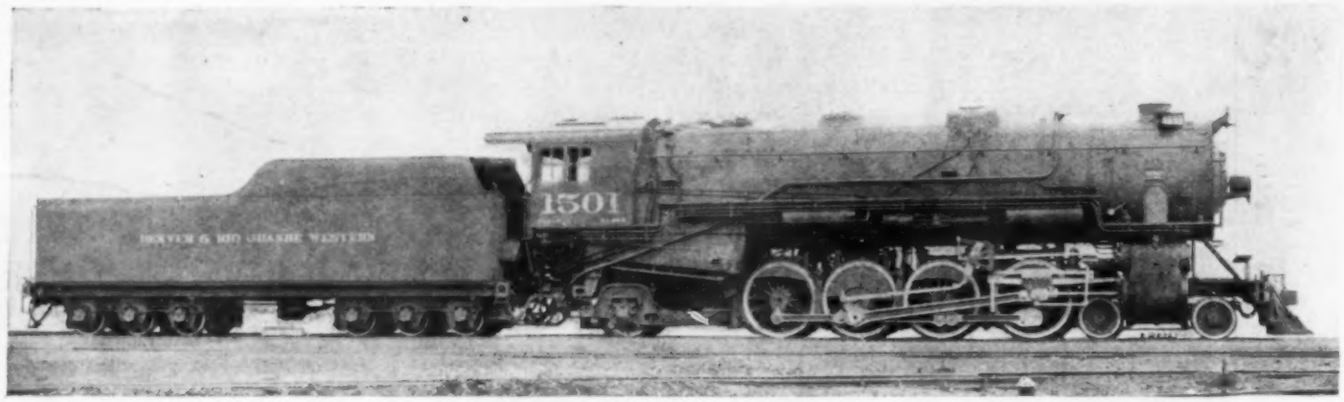




Where
Machine Tools
Are Made

Gould & Eberhardt
Founded 1833





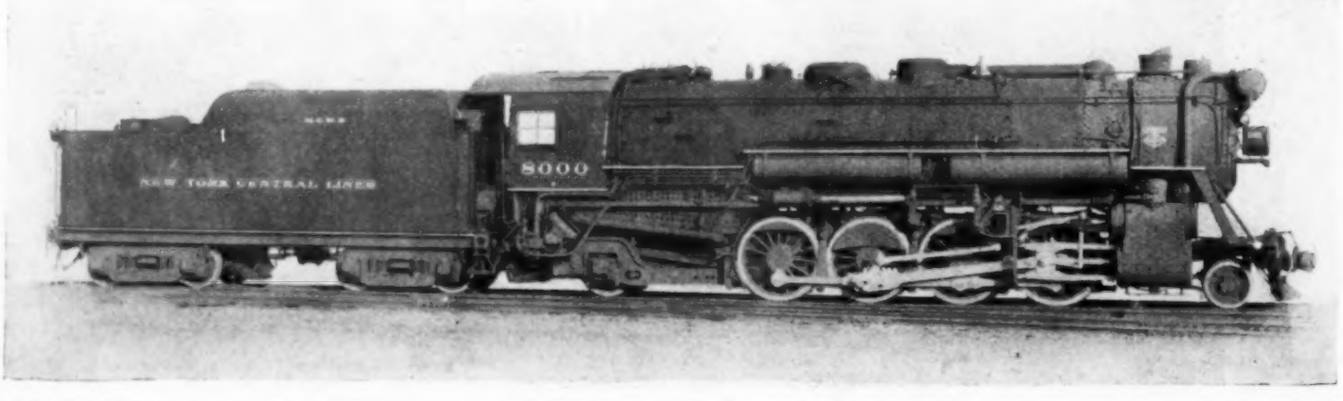
No. 1501, American Locomotive Co. Cylinders 28 x 30 in. Drivers 63 in. Steam 210 lb. Wheelbase: driving 17 ft. 3 in., engine 39 ft. 10 in., engine and tender 82 ft. 2¾ in. Weight: leading 57,500, drivers 257,500, trailing 62,000, total engine 377,000, tender 267,600 lb. Tractive power 66,600 lb. Adhesion factor 3.86. Tender capacity: water 14,000 gal., fuel 20 tons. Superheater.

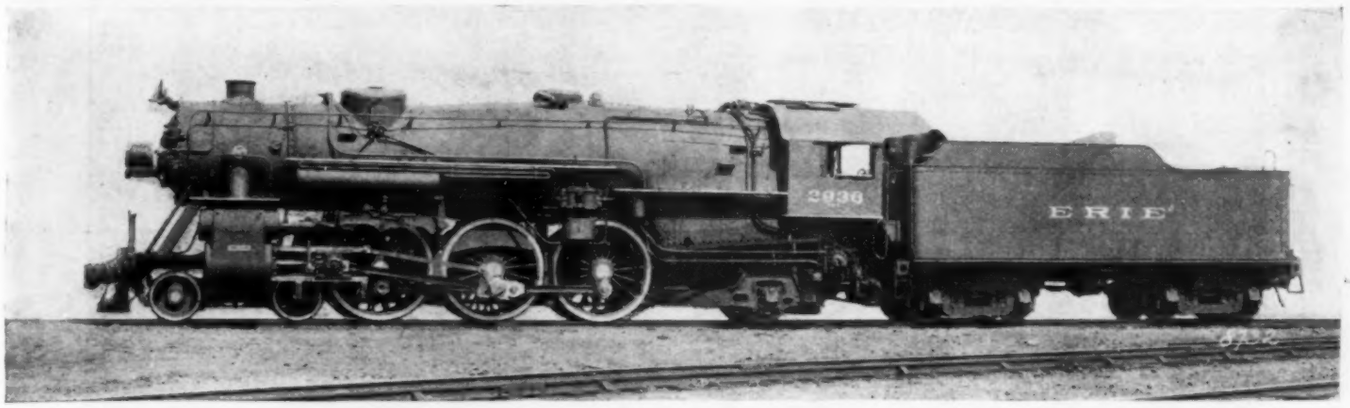
Six Recent Locomotives

Some Typical Motive Power in Different Parts

No. 1022, Lima Locomotive Works, Inc. Cylinders 27 x 28 in. Drivers 79 in. Steam 200 lb. Wheelbase: driving 14 ft. 0 in., engine 37 ft., engine and tender 72 ft. 10¾ in. Weight: Leading 61,000, drives 189,000, trailing 56,000, total engine 306,000, tender 236,000 lb. Tractive power 43,900 lb. Adhesion factor 4.3. Tender capacity: water 12,000 gal., fuel 14 tons. Superheater included.

No. 8,000, Lima Locomotive Works, Inc. Cylinders 28 x 30 in. Drivers 63 in. Steam 200 lb. Wheelbase: driving 16 ft. 6 in., engine 37 ft., engine and tender 71 ft. 6½ in. Weight: leading 30,000, drivers 245,500, trailing 58,500, total engine 334,000, tender 199,700 lb. Tractive power: main cylinders 63,500, with booster 74,500 lb. Adhesion factor 3.87. Tender capacity: water 10,000 gal., fuel 16 tons. Superheater.



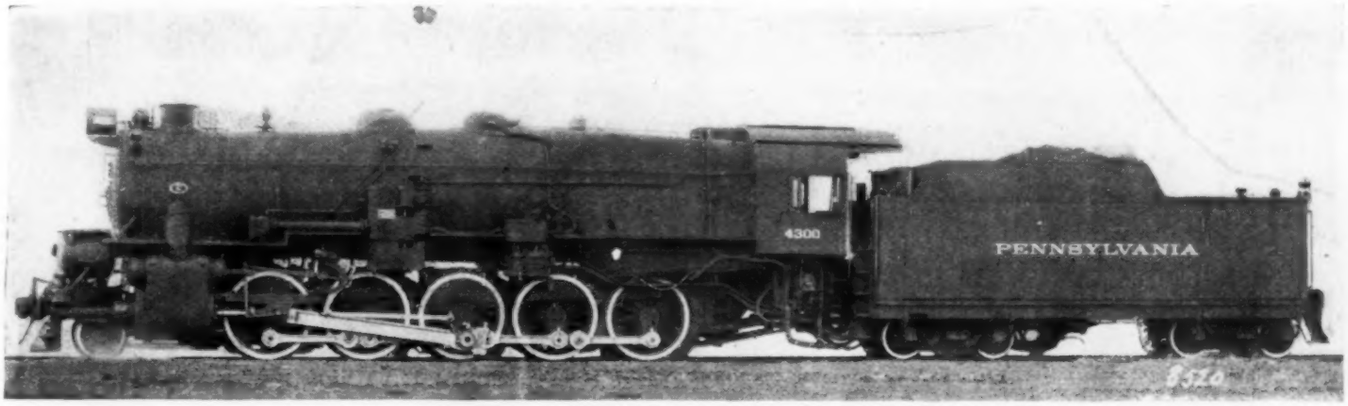


No. 2936, Baldwin Locomotive Works. Cylinders 27 x 28 in. Drivers 79 in. Steam 200 lb. Wheelbase: driving 14 ft., engine 37 ft. 1 in., engine and tender 72 ft. 6½ in. Weight: leading 49,190, drivers 198,960, trailing 59,710, total engine 307,860, tender 188,140 lb. Tractive power 43,800 lb. Tender capacity: water 10,000 gal., fuel 16 tons. Superheater, power reverse and stoker.

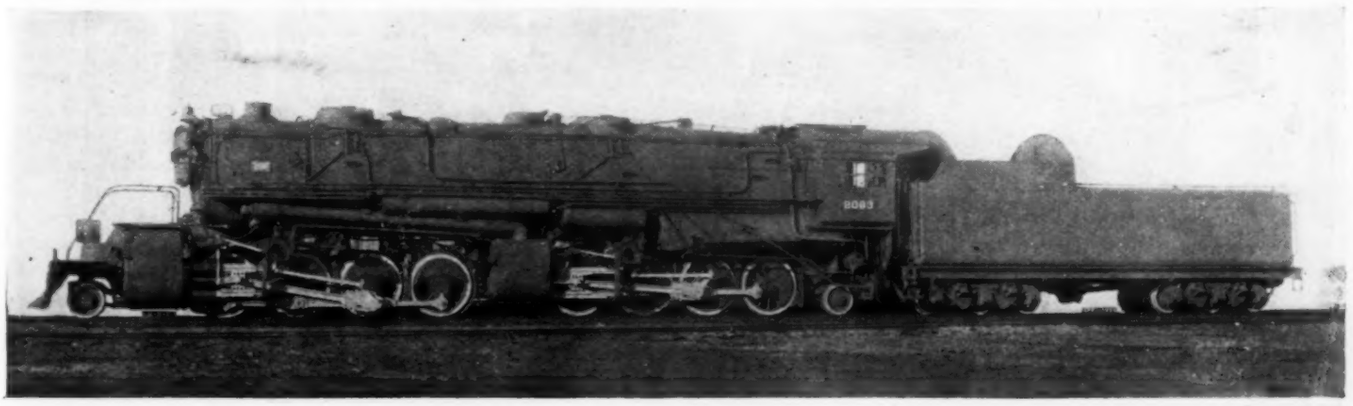
For American Railways

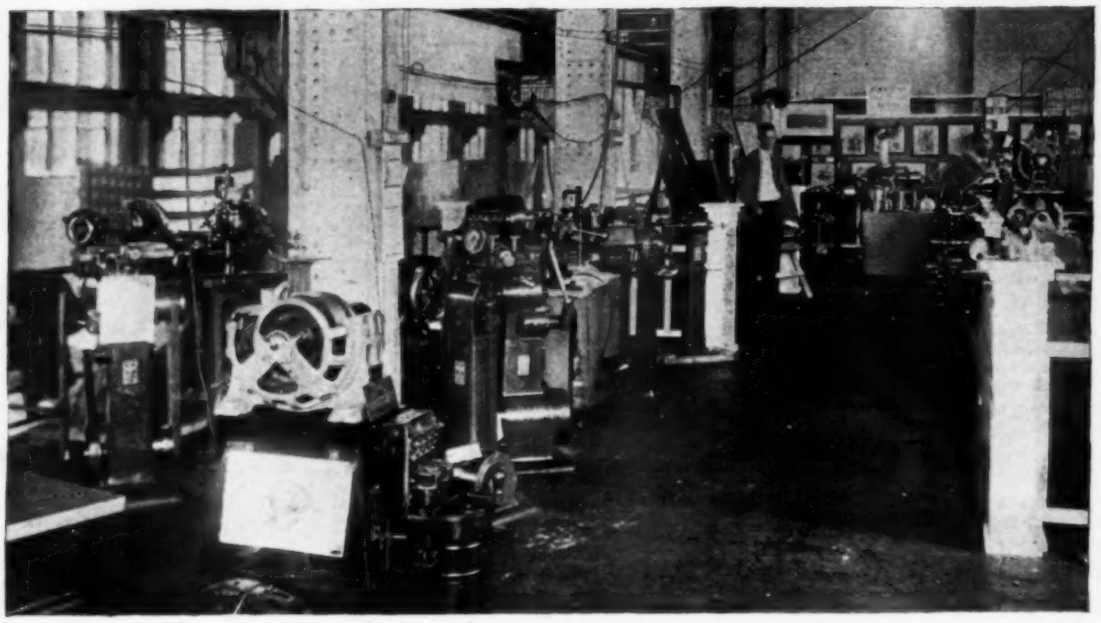
for a Wide Variety of Service of the U. S. A.

No. 4300, Baldwin Locomotive Works. Cylinders 30½ x 32 in. Drivers 62 in. Steam 250 lb. Wheelbase: driving 22 ft. 8 in., engine 32 ft. 2 in., engine and tender 73 ft. ½ in. Weight: leading 33,600, drivers 352,500, total engine 386,000, tender 196,000 lb. Tractive power 87,000 lb. Tender capacity: water 9,000 gal., fuel 35,000 lb. Superheater, feed-water, stoker and power reverse.



No. 2063, American Locomotive Company. Cylinders: high pres. 25, low pres. 39, stroke 32 in. Drivers 57 in. Steam 240 lb. Wheelbase: driving 15 ft. 9 in., engine 58 ft., engine and tender 98 ft. 2¾ in. Weight: leading 29,500, drivers 483,500, trailing 25,000, total engine 538,000, tender 265,200 lb. Tractive power: simple 121,600, compound 101,300 lb. Adhesion factor 4.77. Tender: water 15,000 gal., fuel 17 tons. Superheater.



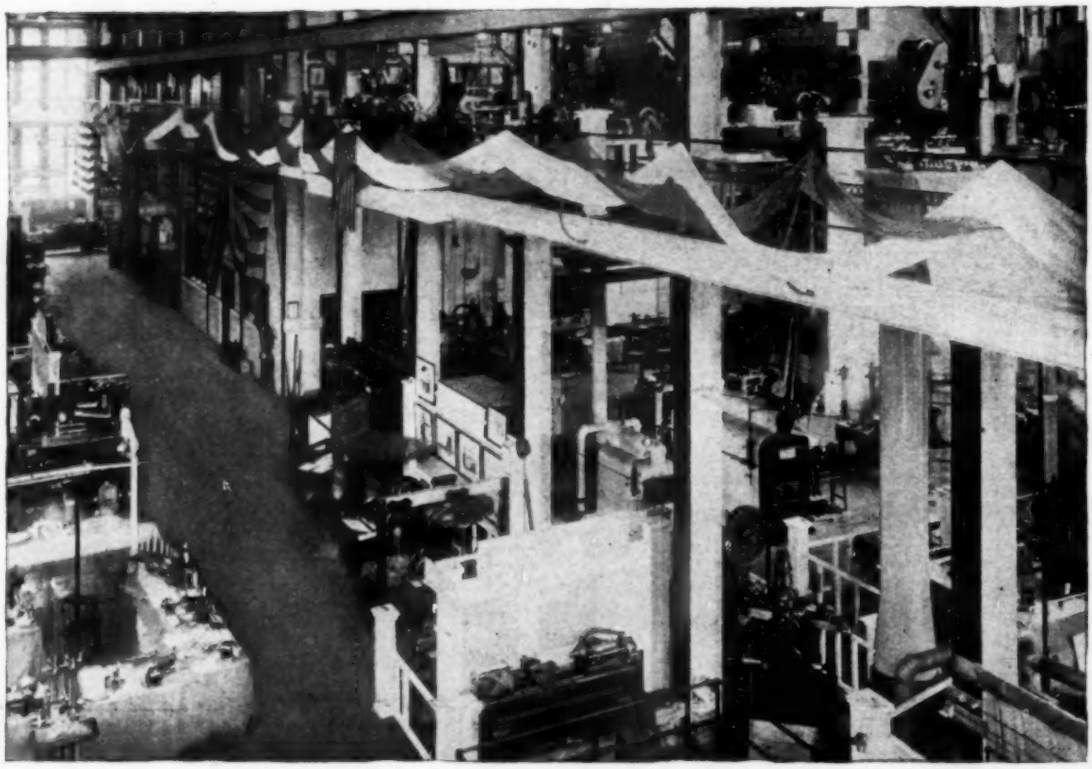


THIRD ANNUAL MACHINE TOOL EXHIBITION

Held at

Mason Laboratory, New Haven, Conn., Sept. 18 to 21, 1923

More than 100 makers of machine and small tools exhibited their products



Industrial Cost Accounting for Executives

By PAUL M. ATKINS

Article twenty-three takes up the problem of recording the product and improvement costs — Checking the distribution and summaries of the items of cost

ALL THE various elements which serve to make up the cost of the product have now been discussed together with the means of recording them. It is now time to turn our attention to the problem which is involved in their summary in such a way as to show the cost of the product. This article will be, to a certain extent, a review of what has gone before in the hope that it may serve to bind some of the various details together which, perhaps, have seemed to have little relation.

The physical basis for the assembly of order or process costs are the material issues, time tickets and bookkeeper's or journal vouchers. These should be filed according to order number after they have been entered in

QUANT. ORDERED / QUANT. COMPL'T'D	ARTICLE				ORDER NO.
ITEM	MONTH	MONTH	MONTH	MONTH	TOTALS
STORES					
WORKED MATERIAL					
LABOR					
VOUCHER REGISTER					
BURDEN					
MISC.					
TOTAL					
WORKED MATERIAL IN					

Courtesy of the Square D Co.

FIG. 53A—ORDER COST CARD

their respective journals, and at the close of each month or when an order is completed they should be totaled and entered on the order cost cards like those shown in Fig. 53 A and B. In some cases where it is desirable to analyze the order costs in great detail it is well to enter each voucher on the cost card as it comes to the file. Forms arranged for this purpose are shown in Fig. 54 A, B and C. The first method, summarizing only once a month or when the order is finished, requires much less labor than the second method, but it does not provide the possibility of quite so much information about the cost of the order, especially some time after its completion.

It is necessary to check the distribution of each of the items of cost against the controlling account entries for each month and that means that the labor, material, and burden for each month must be kept separate from the same items for other months until the verification has been made, and, at the same time, it is essential to check the total of all the orders which are still in process with the balance of the proper controlling "in process" account, and this means that the totals of all items for a month on the unfinished orders must be obtained. Care must be exercised to see that the various steps in the recording of order costs are taken in such a way as to permit both these requirements being met.

The first step to take to add up the material issues in most cases is keeping the stores and worked material separate. It is for this purpose that many group issues

ACC'T NO	QUANTITY	PART AND ORDER NO.

COST CARD

DESCRIPTION

DATE COMP	MONTH	MONTH	MONTH	MONTH	TOTAL
STORES DR.					
SALVAGE DR.					
STORES CR.					
SALVAGE CR.					
NET MAT					
LABOR					
BURDEN F.					
BURDEN G.					
TOTAL THIS MO.					
BAL. FORWARD					
TOTAL					
AMT. CH'D OUT					
BAL. END MO.					
QTY. GOOD					
FIRED SCRAP					SF Z AC

Courtesy of the Union Special Machine Co.

FIG. 53B—ANOTHER TYPE OF COST CARD

are provided with two value columns so that the extensions for stores and worked material may not be mixed. This segregation is also necessary for the successful operation of the material journal, it will be remembered. If a Burroughs duplex adding machine is employed it will be found to simplify the procedure very much for it will permit not only the addition of all the stores issues for a single order, but also the accumulation of the total value for all the orders.

It is, perhaps, anticipating a following article dealing with mechanical aids to cost-accounting to discuss this machine here, but it is such an important help in the task of verification that it merits a few words at this

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Form F 84-A

ORDER COST CARD ORDER NO._____

DATE COSTED ARTICLE NO.

DESCRIPTION

COST SUMMARY

					ORDER TOTALS	REDUCTION FOR EXCESS SPOILAGE	COST TOTALS	COST PER HUNDRED	%
1	QUANTITY STARTED		9	RAW MATERIAL					
2	QUANTITY FINISHED		10	PARTS					
3	QUANTITY SPOILED (1-2)		11	LABOR					
4	% SPOILED (3÷1)		12	FACTORY O.H.					
5	% SPOILAGE CHARGED TO COST		13	TOTAL					
6	% CHGD. TO SPOILAGE (4-5)								
7	AMOUNT ACTUAL SPOILAGE (4 x 13)		DR. ACCT. No.		DR. ACCT. No.		DR. ACCT. No.		
8	AMOUNT CHGD. TO SPOILAGE (6 x 13)		$		$		$		

RECORD OF OPERATIONS

DEPT.	OPN.	HOURS	AMOUNT BONUS	TOTAL	DEPT.	OPN.	HOURS	AMOUNT BONUS	TOTAL
	1					7			
	2					8			
	3					9			
	4					10			
	5					11			
	6				TOTALS				

Courtesy of the Acme Wire Co.

FIG. 54A—DETAILED ORDER COST CARD

place. The mechanism is so arranged that two different additions may be made at the same time. The stores issued for a single order should be added in the upper set of adding wheels and when all the figures for an order have been put in the machine a "transfer total" may be taken which gives the sum of the entries in the upper adding mechanism and at the same time transfers the total to the lower set of adding wheels, leaving the upper set clear. The issues for another order may now be added in the upper set and the total transferred as before to the lower set where it is automatically added to the sum previously transferred there. When all the issues have been added, the total for each order is shown on the adding machine tape and by depressing the "total" lever for the lower set of adding wheels the grand total for all the orders is also printed.

The order totals should then be entered on the order cost cards, and the same series of operations performed for the stores credit slips. The difference between the two grand totals should agree with the monthly total of the stores journal. If it does not, the issues and credit totals should be obtained separately from the journal, an easy matter if the credits have been entered separately in red ink in the stores journal as was advised in the article dealing with that subject. It is then not difficult to see whether the error has been made in the distribution of the issues or the credits and hence the location and correction of the error is facilitated.

The same procedure should next be followed for the worked material issues and credit slips. The result assures the agreement of the material distribution with the controlling accounts. The labor distribution should also be checked in a similar fashion. In this case the figure to check against is the sum of the direct labor charges to be found in the payroll summaries. If the earned burden is allocated by means of a machine rate or process rate, the same verification must be performed,

S. F. 262 P

SYMBOL BATCH NO. DM FF

	HOURS	MACH CHGE.	LABOR	MATERIALS	PIECES	MACH. CLASS
0						
1						
2						
3						

DEPT	HOURS	MACH CHGE.	LABOR	DEPT.	MACH. CHGE.	LABOR
TIs						

Summary

Total Charges other Depts.				
S.D. Receipts				
HOURS				
Machine Charge				
Labor				
CREDITS				
Material				
Total Cost of Batch				

Summarized	Audited	Checked	

Batch		HOURS	MACH. CHGE.	LABOR	MATERIALS	PIECES	W. M. in Stores
	2						
	3						
	4						
	5						
	6						
	7						
	8						
	9						
	10						
	11						
	12						
	13						
	14						
	15						
	16						
	17						
	18						
	19						
	20						
	21						
TTs							

Courtesy of the Acme Wire Co.

FIG. 54B—ANOTHER TYPE OF DETAILED COST CARD

this time checking against the total of the burden journal. If the percentage on direct labor-hours method is employed, the total of the hours distributed to the several orders is the element which requires attention for checking purposes.

When either the percentage on direct labor-hours or charges method is used the earned burden for each order cannot be calculated till after the hour and labor charge totals have been distributed and aggregated against the various orders. It is essential, of course, to keep the labor charges or the hours in the different departments separated from each other for the burden rates differ among the departments. After the burden has been applied it is then necessary to total it for all the orders and check the results against the entries in the controlling accounts.

When all the aforementioned distributions have been checked against the balance of the merchandise in process account.

In the case of worked orders for worked materials, however, certain other steps are necessary. It will be remembered that the worked material when completed is turned into the store-room on the authority of worked material in slips and that the slips were priced at an estimated cost price, usually the last actual cost price. The credit to the worked material in process account and debit to the worked material account is obtained by means of a worked material in journal in which the "in" slips are entered day by day. It is quite evident that if the debits to the worked material in process account are the actual costs of labor, material, and burden, and credit is made on an estimated basis, the balance of the account will not show the time condition of the worked material in process unless some adjustment is made. In

SE-66 A P 3m 5 14

COST RECORD CARD

FOR

CHARGE SYMBOL				
TOTAL LABOR			COM-PUTED	JOURN-ALIZED
" STORES				
" W. M. STORES				
" MISC.				
TOTAL FLAT COST				

LABOR				STORES			WORK. MAT'L STORES			MISCELLANEOUS	
DATE	AMOUNT	DATE	AMOUNT	DATE	ISSUE NO.	AMOUNT	DATE	ISSUE NO.	AMOUNT	DATE	AMOUNT
		BR'T FOR'D									

FIG. 54C—DETAILED COST RECORD CARD

checked together with the bookkeeper's vouchers for direct charges, it is then time to assemble the order costs. It may seem like a rather useless waste of time to do all this verification, but it must be remembered, first that a large number of vouchers enter into these distributions and it is not surprising if mistakes occur from time to time in spite of all the care which may be exercised to prevent them, and, secondly, that if gross errors are allowed to pass uncorrected, the final results will not be sufficiently accurate to aid the executive greatly in the control of his business. On the other hand it must not be thought that agreement can readily be obtained between the summation of the details and the totals. If the differences are small—fractions of a per cent, or sometimes even as much as 2 per cent of the total involved—it is not worth while making a meticulous search for them. In part they may be accounted for by split cents and in part by slight errors which it would cost more to find than it would be worth in additional accuracy once it was found.

The next step is to sum up all the elements of cost for each order for the month and check against the totals debited to the controlling "in process" accounts, leaving out of consideration, of course, the balance of the account remaining from the preceding month. This is done to assure the correctness of the entry of all the details which have previously been discussed.

It is now time to separate the completed from the uncompleted orders. In the case of the orders for merchandise, the unit price may be figured and any other analyses made which may be of benefit to the executive. The unfinished orders should then be totaled and some cases this adjustment is a credit to the account and sometimes a debit depending on whether the estimated price at which the worked material is credited is too low or too high.

The time to correct this account is at the end of the month. The necessary amount is found by ascertaining the difference between the actual cost of the order as shown by the order cost card when the order is completed, and the estimated value as shown by the worked material in slips which should be filed with the other vouchers which belong to the order. The net total of these differences should be obtained and a general journal entry made of it for posting to the worked material variation account in which the variations should be allowed to accumulate till the end of the year when it can be closed into the profit and loss or surplus account. If the estimating is done carefully and slight modifications made of the last actual cost price to meet changing conditions, the net variation for any one month is likely to be very small since the variations of the several orders tend to cancel each other. It will also be found that the entries in the variation account will also tend to offset each other and hence the final adjusting entry will not be found to be very large.

The cost cards of the unfinished orders should then be totaled and checked against the balance of the worked material in process account. The value of the worked material in slips must be deducted from the total for the orders if there are any. If the orders have been divided into lots or batches, this problem will not exist for each batch can be handled as a separate unit. In

figuring unit costs for the month it is essential to include all batches or lots of an order finished within the month in order to smooth out irregularities. If there are conspicious differences in unit costs among the various lots it is well to analyze them carefully to discover the cause, if this is possible, but the unit cost—when it is spoken of without further qualification—should be the average for all units completed during the period in question.

It is now possible to dispose of the vouchers. Usually they are filed all together according to order and lot number in a dead file. They are seldom wanted again unless a very detailed analysis of the order cost is required. Such an analysis is needed from time to time when anything peculiar is noted about the order or its cost, and hence this filing should not be treated in a perfunctory way. Though rarely wanted, if the operation of the factory is under reasonably satisfactory control, when they are needed, the need is immediate. In some cases, too, the auditors like to look over a few sample orders to satisfy themselves in regard to the accuracy of the record keeping.

When the cost records are to be kept in the form of process costs, it will usually be found that they are much simpler than in the case of order costs with one exception. So long as the product is not so changed in going through a process that the individual units lose their identity or rather the capacity of being measured in the same fashion, both before and after the process, it is quite simple. The quantity going in can be measured in the same terms as that coming out and the difference must be in process. When this is not possible it often becomes necessary to measure what remains in process and then a practical engineering problem of considerable difficulty is met. Usually it is safe to treat all material in a certain process at the end of a period as half done, and so give its quantity half the importance of the units of finished product which have been turned out during the period. Knowing the quantity of material involved and the cost of the labor, material and burden charged to the process it is a simple problem to ascertain the unit cost for the process.

Improvement Costs

The recording of the details of the improvement costs is substantially the same as for the product. Orders, of course, should be issued for all work of this kind and these orders should be made the basis of all cost records. The distribution of labor and materials should be verified in the same way as for the product.

Whether or not burden shall be applied to such orders is a very much debated question. Usually it is decided on the basis of expediency. If only a few improvements are made by the factory itself, they are usually produced by the maintenance department and under such conditions it is almost impossible to work out any satisfactory burden rate. On the other hand where large quantities of tools and even entire machines are made within the factory, often in the tool department, it would seem desirable for several reasons to charge burden to such work and under these circumstances it becomes much easier. The addition of burden will give a better basis for comparison of the costs with the price it would be necessary to pay to obtain the same articles from outside suppliers. With the present tax laws, also, it is more satisfactory to allocate this cost to the permanent assets.

Unless there is a large amount of any one class of improvements such as tools, it is often convenient to have only one improvement in process account. It must not be forgotten that there are almost invariably several fixed asset accounts to which the completed improvements are to be charged when completed. This does not need to cause any difficulty. A single general journal entry crediting improvements in process account and debiting the appropriate fixed asset accounts for the improvements which have been finished during the period is quite sufficient. It must not be forgotten also that a plant register card must be made out for each new improvement, except for such as are additions to already existing assets, in which case the value should be added to the plant register card for the asset in question.

Controlling Account Entries

Before closing this article it may be well to show the entries to the controlling accounts affected. Some of these overlap with accounts already shown but this will only serve to knit together more closely the fabric of the accounts.

Worked Material in Process Account

Stores journal (value of stores issued for the production of worked material. Credit therefore to the stores account.)

Worked material journal (value of worked material issued for the production of other worked material. Credit therefore to the worked material account.)

Payroll book (value of labor expended directly on the production of worked material. Credit therefore to the payroll account.)

Burden journal (value of earned burden apportioned to work material in process. Credit therefore to the manufacturing burden account.)

Voucher register (value of direct charges incurred for the benefit of worked material. Credit therefore to accounts payable account.)

Worked material in journal (value at estimated cost price of the completed worked material. Debit therefore to worked material account.)

General journal (account of variation between actual and estimated cost of worked material when the actual is greater than the estimate. Debit therefore to worked material variation account.)*

The debit balance of this account represents the value of the worked material in process at the end of the period.

*If the actual cost is less than the estimated then this account will be debited and the variation account credited.

Merchandise in Process Account

Stores journal (value of the stores issued for the production of merchandise. Credit therefore to the stores account.)

Worked material journal (value of worked material issued for the production of merchandise. Credit therefore to the worked material account.)

Payroll book (value of labor expended directly on the production of merchandise. Credit therefore to payroll account.)

Burden journal (value of earned burden apportioned to merchandise in process. Credit therefore to manufacturing burden account.)

Voucher register (value of direct charges incurred for the benefit of merchandise. Credit therefore to accounts payable account.)

General journal (amount of the merchandise completed during the period. Debit therefore to the merchandise account.)

The debit balance of this account represents the value of the merchandise in process at the end of the period.

The entries in the merchandise account are quite simple. The debit comes, as is indicated above from the "in process" account, and credit represents the value of the goods shipped during the same period.

MERCHANDISE ACCOUNT

General journal (value of the completed merchandise for the period. Credit therefore to the merchandise in process account.)

General journal (value of merchandise sold during the period. Debit therefore to the trading account.)

The debit balance of this account represents the value of the completed merchandise on hand at the end of the period.

The improvements in process account is so like the worked material in process and the merchandise in process accounts as not to need repetition here. To indicate the manner in which the completed improvements may be credited to one account and debited to several others, the general journal entry follows:

Machinery account
Buildings account
Furniture and fixture account
Tool account

Improvements in process account

To transfer the value of completed improvements from the "in process" account to the proper fixed asset accounts.

We now have before us the complete cycle of the operations involved in recording the cost of product and improvements. The information so developed is of benefit to the executive in the control of his business, but to a very considerable extent the value of the cost records are due to what may be called the "by-product" of the work involved in securing unit costs. Some of the uses of industrial costs have already been pointed out in an earlier article, but before going on to a further discussion of them a few articles must be devoted to the details of the work of the cost department.

Benefits of Vocational Training

BY W. ROLAND NEEDHAM

THAT which stimulates and fosters legitimate interest in one's vocation is worthy of all encouragement. They do the best work, and on the whole the work that pays best, who are keenly interested in what they do. The boy who is to turn out really good work will do far less than his best unless he knows something of the wherefore, the why, and the whence, as well as the how of it all.

The temptation peculiar to those who deal with machine tools and processes is that the machinist be content to be merely a machine attendant or operator. Almost unconsciously he may become well nigh as automatic and mechanical as the tool he uses—in fact he may be just part and parcel of the machinery itself. Where this is so the quality of his work undoubtedly suffers, and he becomes a lesser man than he might be. Even if his hand almost identify itself with the tool he employs, his mind should at all times be the directing agency.

Where a lad is deliberately, and of set purpose, urged to inquire what it is he does and why he does it, how his bit dovetails into other bits, how all the bits work together, and what the whole of it is for, that boy has one of the biggest assets life can give him. Sooner or later he will himself discover things of value, and always there will be the reward and the lure of the paths which open to right and left of such a course. What the open road is to the lover of nature so will his career be to him.

Much depends upon the nature of the instruction offered. The machine shop foreman, however sympathetic he may be and however able an instructor, has neither time nor opportunity to tutor effectively the apprentices entrusted to his charge. These lads must do the work assigned to them, and must for the most part pick things up each as seems to him best and according as his peculiar bent dictates.

THE COMPETENT INSTRUCTOR

In the vocational school, however, everything is different. There the teacher is usually a practical man. He knows the inwardness of things from his own first-hand experience, and he also accumulates that knowledge of the needs of the boys themselves which stands them in such good stead. The personal touch and the intimate grip of matters, which he has the time and opportunity to give, mean very much indeed to those in his charge. The right teacher can make the right pupil.

The curriculum should aim at legitimate wedlock between practice and theory, and the issue will be strong, virile, and full of promise. The aim too should be not only to present detailed instruction in the departmental sense, there should also be some attempt to provide that larger outlook which shall enable a boy to envisage parts in their intimate inter-relations and as related to the whole. Those who can be led to realize how processes dovetail into each other, and how all minister to the completed product, will be well equipped as they enter upon their engineering career.

So long as those responsible do not swing to the opposite extreme, and starve theory in order to develop adequately the practical side, nothing but good should result from the labors of the vocational school. There, as elsewhere, scope should be found for the lad whose bent induces him to probe deeply into the foundations of things. He will find out in any case. So much the better, however, for everybody, if such as he be given a sympathetic lead and offered a helping hand. These lads become the men who discover things and make things move.

In conclusion, all whose training is academic and theoretical, rather than practical, also stand greatly in need of just such instruction in craftsmanship as the vocational school offers. Many strange perversions would never see the light of day if those concerned were in possession of the merest rudiments of practical knowledge. It is only they who have this elementary grasp of material things who can hope to steer clear of certain pitfalls in design, as distinguished from execution.

NEED FOR PRACTICAL TRAINING

Often it is the workshop end which has to save the face of the technical issuing staff by suitable modifications here and there. This should not be, and need not be. It will not be, if the vendors in ideas will take the trouble to come to earth and material requirements. They need not seek to emulate the craftsman in skill of manipulation, but they most certainly should know enough of processes to appreciate inherent difficulties and meet certain requirements, none the less real because in a way subsidiary or incidental. They need something which the vocational school provides in practicable form.

Belt Drive Betterments

By L. M. Francis

IN OPERATING belt-driven machinery of any kind, it is important that the belts used deliver sufficient power to get the maximum result possible with the equipment in use. If this is not the case, a continual waste of time is occasioned, which may grow to large proportions and represent a considerable amount of money, as time goes on.

With what may be termed the more ordinary types of machines such as lathes, planers, drills, etc., it is quite often the case that the matter of how much power is being delivered to the cutting point is given too little attention. If a machine will not pull the desired cut a lower speed or feed is used, and while, to all appearances, good results are being obtained, the production is not as high as might be.

In the maintenance of belting it is of primary importance that, in each location, the proper kind and quality be used. The operating force usually knows what belts will give the best results. In many cases, over a period of years, they have been supplied with many brands which have been run on various machines, thus giving good opportunity for observation on this point. Once the proper belt is determined, that kind should be used. I do not mean by this that new kinds should not be tried out to find a better kind if possible, but this trying-out process should be localized, and a new type should not be generally applied till it has proved itself better.

Purchase Price Considerations

In this connection it is probable that the purchasing department is often at fault in assuming that a belt is a belt in any case, and in buying on consideration of price, or otherwise, without regard to specifications furnished by the shop. Then again, such specifications may not be furnished, leaving the matter open.

It is usually poor economy to buy belting on price considerations alone, for any saving effected may be lost many times over in lessened production and rapid depreciation. If, however, low price goes with necessary quality, it is a desirable combination. I do not maintain that the highest priced belt is always the best. The important thing is to get the one that gives results, and the primary result is the delivery of satisfactory power.

Another bad condition, for which the responsibility may lie either with the shop for doing it, or with the management for not buying in sufficient quantity, is the use of belts after they have outlived their usefulness. Old belts do not necessarily have to be thrown away. They can often be cleaned, split, trimmed, re-glued, or otherwise worked over, so as to be satisfactory in locations, other than where applied when new. It is certain, however, that belts full of oil, ragged at the edge, loose in the joints and, in fact, worked till their life is gone, will not deliver the power they did when in good condition.

As an example of this, I recall a modern, heavy duty lathe used on fairly large work, which should have had an abundance of power, but was found to be incapable of beginning to pull the kind of a cut it should. On investigation, it was found that this was due mostly to the fact that the line shaft belt was slipping. This was an old belt which should not have been in use and the substitution of a new one remedied the difficulty.

Belt power depends not only on size and condition, but also on running speed. On one large lathe I have in mind, even a reasonably heavy cut caused the line shaft belt to slip. A larger pulley was placed on the line shaft to increase belt speed at that point, and the difficulty was reduced, with consequent increase in production rate. With lathes, if it is desirable to keep the countershaft turning at the same speed, both line and countershaft pulleys can be increased in diameter to get greater belt speed between them.

Sometimes additional cutting speed, as well as power, is desirable, and higher cutting speed will generally be used if the power is available. We had in one plant a large planer and while it was in good condition, the operating speed was very slow. For this machine we made new pulleys and necessary alterations to replace the 3-in. single with 4½-in. double belts, and increased the operating speed about 50 per cent. It worked exceptionally well after these changes, and sometimes on work running into tons in weight.

In speeding up planers it is perhaps more necessary to consider, than with other types, what the result will be. This is due to the fact that the heavy weight of table and work combined must be reversed in direction at the end of each stroke and, if this weight is traveling too fast when reversed, the belts will slip, or the driving gear may be broken. Due to this fact, it may be found feasible to speed up the cutting stroke only, as was the case with a fairly large machine, where the cutting speed was raised from approximately 16 to 22 ft. per min., with no change in reverse. Even with a change of this kind, the net gain in production is considerable, especially if the machine is working on long cuts.

Another means of obtaining increased driving power is, of course, by the use of double belts in place of single, with no changes in widths or size of pulleys.

The above remarks are from the writer's experience of what can be done in the way of increasing productive ability by means of more efficient power application. What can be accomplished in specific cases can only be determined by giving the matter some consideration and trial. With the possible improvements and saving in time in mind, it would seem worth while to deem such procedure of some importance, and worthy of study and attention. On top of direct gains, it is certain that a feeling of more satisfaction will be aroused with the operators, if their belts are pulling when they want them to.

This is not in any way an argument for the use of old machine tools in place of modern ones, but is offered in the way of suggesting improvements that may be possible in cases where the machinery is there and must be used.

The Passing of Cast Gearing

A little evidence of the great change in gearing practice is noticeable in the recent announcement of a new book on patternmaking. The striking part is that no mention is made of patterns for gearing. A few years ago no book would have been complete without a substantial section devoted to the making of gear wheel patterns, both spur and bevel. In fact many of the older books on patternmaking would have been slim affairs without it. But cast gearing is fast becoming ancient history and patternmakers now have other problems which demand equal attention.

Skoda and the Revolution of Pilsen

By HENRY OBERMEYER and ARTHUR L. GREENE

The cause for the change in products produced—Activity in railroad and locomotive equipment—Skoda's resources —Conditions regarding labor, coal and raw material

THE TWO contrasting pictures herewith show more clearly than any words the revolutionary transformation undergone by the biggest machine and ammunition factory in old Austria, the Skoda works, now in the new nation of Czecho-Slovakia. Where, before and during the war, the greatest shops of the company were bristling with long range guns, dreadnought turrets and other implements of war as shown in Fig. 1, today one sees only the construction and assembling of locomotives, such as illustrated in Fig. 2, newspaper presses, milk separators and similarly peaceful and productive work in hand. It has been a change more radical and more extensive, in all probability, than that of any other factory of comparable size in Europe, not even excepting those of France, northern Italy and Belgium which were destroyed physically by the forces of war.

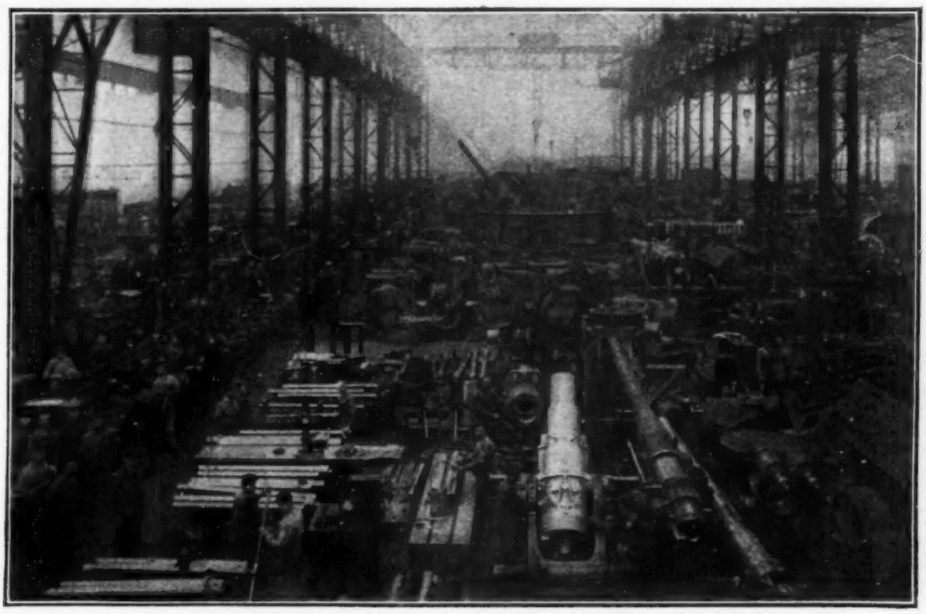


FIG. 1—TYPE OF WORK IN THE SKODA WORKS DURING THE WAR

The change has been not merely one of form but one of kind. Barring the production of steel forgings on which the foreign reputation of the works is largely based, and excepting a certain amount of war materials still manufactured as a matter of routine for the not inconsiderable standing army of the country and, as a matter of politics, for the Kingdom of the Serbs, Croates and Slovenes, the Skoda Works have, since the war, diversified their output and extended their range of activity to such a degree that it can be truthfully said, the old factory has disappeared to make room for a new. The result is that while other factories of Czecho-Slovakia are almost daily adding to the growing problem of unemployment with which the nation is contending, Skoda has found it possible to employ nearly twice as many workers as it had before the war.

From the standpoint of economics this fact in itself is a remarkable feat. Before the Treaty of Versailles ripped its most productive territory from the side of Austria to make a buffer state between the two great German speaking nations of Central Europe, the Skoda Werke of Pilsen occupied a position in the dual monarchy not dissimilar to that of Krupp's in Germany. When the war came the Skoda plants were rapidly enlarged and together bore the burden of supplying the Austrian armies with the bulk of their artillery. When the war ended it seemed as if the world demand for war materials would cease for good and all, and that factories like Skoda would be forced to close up shop in part at least or cast about for ways and means of adapting themselves to the changed conditions of the market.

This was not the worst, however. Austria-Hungary was a great territory sheltering a large population of variegated peoples with variegated needs and admirably placed in the valley of the Danube River for direct and easy transport to almost every part of the domain. The great mass of the people were farmers or tradesmen catering to farmers. This state of affairs meant a great consuming capacity for all products, not the least of them machinery. It also meant, unfortunately, that the industrial resources and manufacturing centers of the country were bunched together almost entirely in what has since become Czecho-Slovakia; that is, in Bohemia, Moravia and Silesia.

Before the disintegration of the empire took place, the comparatively small section produced for a population of approximately 50,000,000 persons distributed over an area of 600,000 sq.km. The territory was a small world market in itself and under the impetus the

industries grew and flourished rapidly. The land in the industrial region was rich in coal and iron and other natural resources which made it almost self-sustaining from the manufacturer's point of view. Then, suddenly, just as the factories had reached the peak of their productiveness, their markets were cut down by the incision of a boundary line to approximately a quarter of their former size; in short to a population of about 14,000,000 in an area of 142,000 square kilometers.

Therefore, only 25 per cent of what was formerly Austria-Hungary is expected to sustain nearly 80 per cent of that nation's former industry. Czecho-Slovakia thus presents the spectacle of a country acutely suffering from ar embarrassment of riches. Supporting a population given over chiefly to manufacturing, she finds that, where she had free intercourse before, the barriers of trade rivalry are raised against her. Like an inefficient workshop she has installed an engine generating four times as much power as she can ever use.

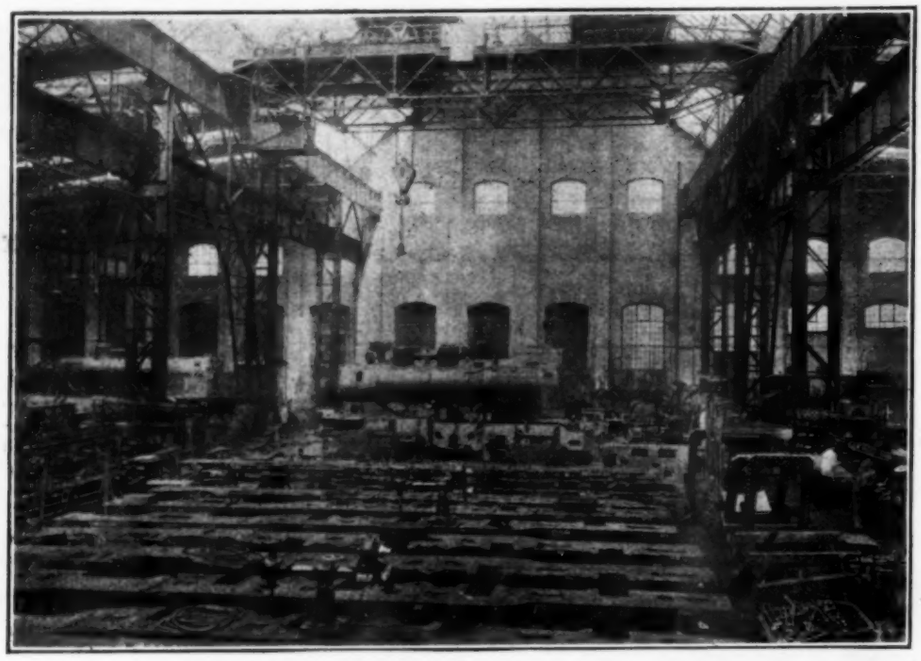


FIG. 2—LOCOMOTIVE ASSEMBLING AT SKODA WORKS

Only two lines of procedure are practicable. Either she must reduce her productive power radically, which means untold suffering and the complete disappearance of many of her largest factories, or she must find within a reasonable time new fields in which to export her products where prohibitive customs duties and low priced competition will not militate against her.

One of the engineers of the Skoda Works estimates that Czecho-Slovakia to exist industrially must export at least 60 per cent of all her manufactures. If this condition is so, then anyone who is in the least acquainted with the export market of today can realize the situation which Czecho-Slovakia is facing.

The Skoda Works, as has been intimated, are an exception, temporarily at least, to the general rule; and, although the abnormal activity of a part, with depression in the other branches, does not augur well for the condition of the whole, yet the particular methods and policies by which Skoda has escaped the economic consequences of the peace make an interesting and significant study in themselves.

Four tendencies are to be particularly noted in the growth of European machine industries since the war. They may be classified as: standardization, specialization, conservation and variation. The last is the solution which the Skoda Works have applied to their problem and which, in the long run, must be adopted by all the large machine manufacturers of Czecho-Slovakia. It is a solution which of necessity applies to any industry working for a restricted market.

In following out this policy the Skoda Works have deliberately scorned the entire field of machine manufacturing in the country. They have bought patents from machine factories both in and out of Czecho-Slovakia, have experimented along new lines of manufacture, and have gone afield to study the demands of other countries. Just how the extension has taken place may best be illustrated by the following figures:

The total yearly productive capacity of the Skoda Works, according to the last estimate made a year ago, is 316,000 tons. This tonnage is distributed roughly as: cast steel, 20,000; electro-steel, 4,000; ingots and blooms, 100,000; cast iron, 10,000; brass, 1,000; aluminum, 500; large forgings, 25,000; small forgings, 15,000; pairs of wheels and axles, 22,000; gearings, 5,000; locomotive works, 25,200; motor car works, 1,600; heavy ordnance and ammunition works, 15,000; general machinery and boiler shops, 71,700. To this, however, must be added many new items under the head of miscellaneous which, at the time the estimate was made, were still under consideration or experiment. Thus, the production of dynamos and electric motors was begun but recently after long deliberation, and the first of them have not yet been finished at this writing.

The company began the manufacture of agricultural machinery, for which it was thought there would be a big market following the unproductive and destructive years of the late war, by buying from the Prager Works of Prague their patent on an 80-hp. heavy motor plow. Tractors and smaller plows, it was believed, would be demanded to fill the places of thousands of horses which had been sacrificed to battle, wherefore they, together with cream separators, were added to the agricultural program. The war led to unusual depression in most of the factories of the warring countries, so that an increased demand for steam and gas engines and stationary boilers of all kinds was a foregone conclusion. The Prague Iron Works and the Alpina Montan Geselschaft have been among the best customers in this field. Much the same conditions existed in the mines, which had been not only worked too hard in the haste to turn out sufficient war materials for the army, but the machinery of which had also been allowed to deteriorate. At the same time, mining on a wider scale became a matter of vital necessity for such countries as Austria and Germany from whom large slices of their richest territory had been taken by the peace, and conveyors and ore

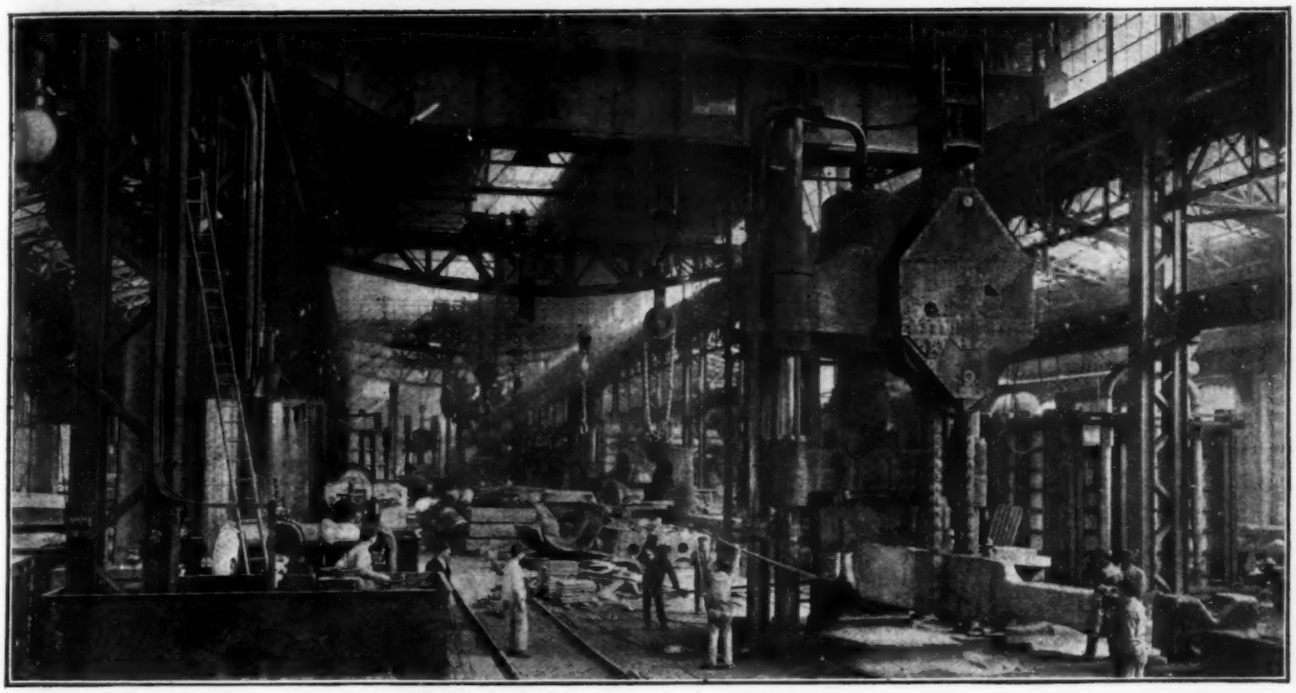


FIG. 3—FORGE SHOP AT THE SKODA WORKS

separators were therefore added to the list. Finally, although shipbuilding throughout the world had received a set-back during the past two years, there was a pronounced boom in shipping for at least that length of time immediately following the war, and the Skoda Works still send steam turbines and marine engines to Italy.

Locomotive and Railroad Equipment

Interesting as they are, none of these new branches have been quite as important as the extension made in the direction of locomotives and railroad equipment. Although this represents an old department in the Skoda Works, it is also one which has experienced a new growth since the war.

To meet the new demand the Skoda Works transformed their entire factory in less than a year and a half after the war. The conditions of construction work were comparatively simple. No new types of locomotives were demanded, since the Czecho-Slovak Government, pending the development of electrically run railroads, preferred locomotives of a type which would afford easy interchangeability of parts with old engines which had been left to them under the treaty. Prac-

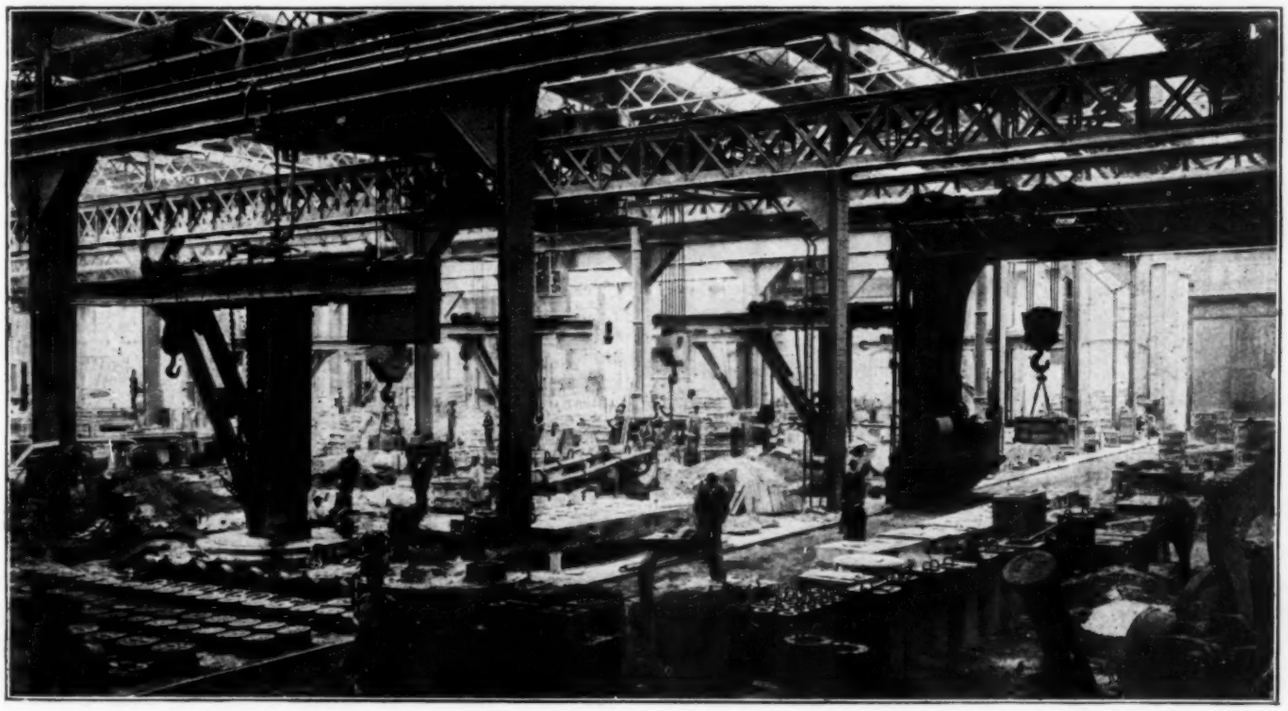


FIG. 4—SECTION OF STEEL FOUNDRY AT SKODA

tically the only new type, in fact, which has been built by the Skoda Works since the war is an 83-ton locomotive with a 2-10-0 wheelbase. The standard type of passenger locomotive in use by the Czecho-Slovakian State Railways is a twin cylinder tank locomotive with a 4-6-0 wheelbase.

Most of the work undertaken for the Balkan railways is repair. Recently, however, Skoda secured an order from the Roumanian Government for 100 freight locomotives with a 2-8-0 wheelbase. In most respects these locomotives are similar to the type of standard freight locomotive in use on the Czecho-Slovak railways, the principle points of difference being that; the latter has a diamond stack designed for firing by brown coal and equipped with a star shaped spark arrester, while the former has a taper chimney; in the latter the netting inside the smoke box is flat and semi-cylindrical, while in the Roumanian the smoke box is provided with a bucket netting; the Czecho-Slovak type has a Hardy brake with 1-in. tubes acting only on the locomotive and the tender, with brake valves, while the other is equipped with an automatic continuous Westinghouse brake; and, finally, while the latter is fired only by coal, the former may be fired both by coal and naphtha according to the Cosmovici system. There are other minor differences not connected with the actual operation of the train.

Naphtha for Locomotive Firing

An important feature of the Roumanian type, as noted above, is that the locomotive is built for firing by naphtha as well as coal. For naphtha firing a special opening is provided underneath the fire door, to which a naphtha dispenser (Cosmovici system) is fixed. A Cosmovici heating system is placed on the left side of the boiler. The locomotive is coupled with a tender rolling on three axles and capable of carrying 15.8 cu.m. (4174 gal.) of water, 6.3 cu.m. (9½ tons) of coal, and 4.5 cu.m. (1190 gal.) of naphtha.

But to return to the subject. There is the danger that the rapid extension of the Skoda Works in all its branches may be taken a bit too easily for granted. As a matter of fact, it should be obvious that no machine factory can suddenly divert its productive energy into widely varied channels unless there is at the bottom of that effort not merely an elaborate and well defined program, but the necessary resources of labor, experience, machines and raw materials to make it possible. This is all the more true in the case of a concern the size of Skoda.

For the most part Skoda was possessed of those resources, and those it did not have it went about acquiring in the shortest possible order. The foundation of Skoda's strength was and is today in its forge, a section of which is shown in Fig. 3, and in its foundry. It was one of the first plants in Europe to begin the making of crucible steel, which it took from Krupp's and developed to a point above the majority of its continental rivals. It was the largest forge and factory of Austria before the war, and has the largest foundry, partly shown in Fig. 4, in Czecho-Slovakia today. Its three electric furnaces of a 4 to 6-ton capacity apiece, one of which is shown in the illustration, Fig. 5, are able to turn out steel surpassing in strength that of any other factory in the country if not in the entire eastern part of Europe with the possible exception of the highly specialized Böhler works in Austria. By a secret process it has developed the manufacture of a manganese steel, especially for rails, cement mills and crushing machines, which possesses resistant qualities making it impossible to handle the steel by any other method than that of grinding. A Harmet press with the enormous pressure of 10,000,000 kg. is used for pressing liquid steel. Then and now the greatest part of the Skoda castings is sent to other countries and to other factories. It is not generally known, but the pipe bends installed in the giant turbines at Niagara Falls were turned out in the Skoda factory just before the war. The size of the pipe bends can be judged by glancing at Fig. 6. The foundry, in fact, is capable of making castings to almost any size and intricacy. Probably the largest ever made there was the flywheel of a gas engine illustrated in Fig. 7, the single casting of which weighed fully 100,000 kilograms.

With this equipment it is no miracle, therefore, that Skoda has been able to combine a large and variegated section of the machine industry of Czecho-Slovakia within its scope of operation. Scarcely less important than the forge and foundry, however, both of which together virtually comprise the factory as it stood be-

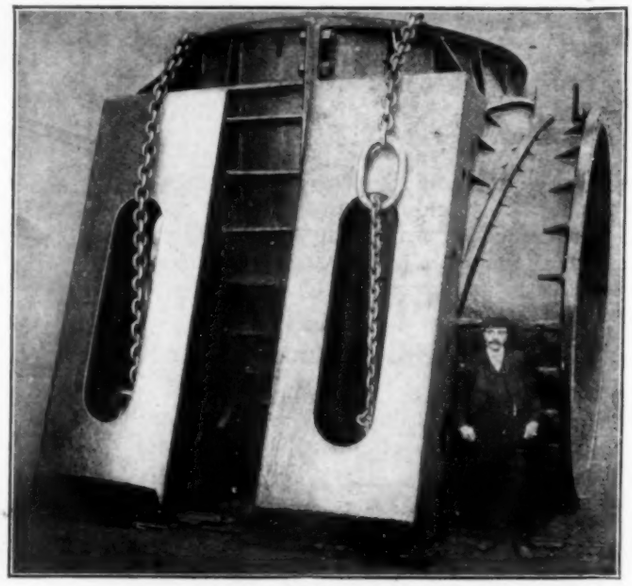


FIG. 6—PIPE BENDS FOR TURBINES AT NIAGARA FALLS

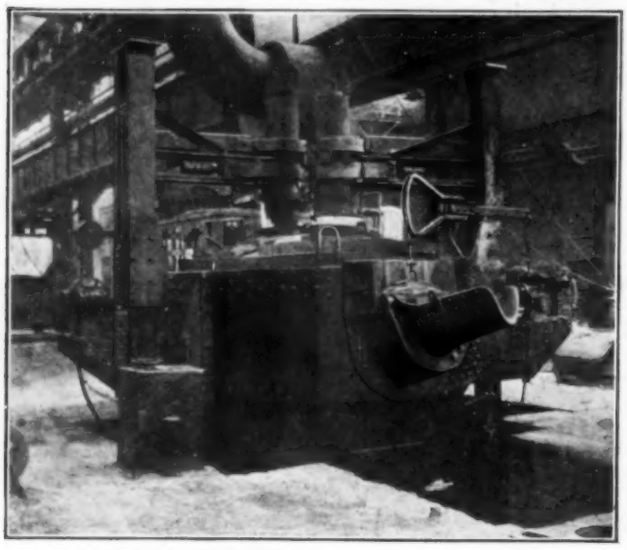


FIG. 5—ONE OF SKODA'S ELECTRIC FURNACES

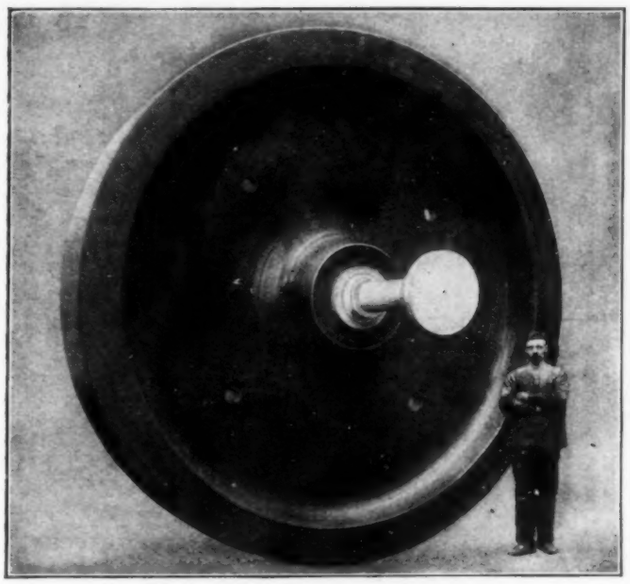


FIG. 7—A 100,000 KG. GAS-ENGINE FLYWHEEL

fore the war, is the recent acquisition of the Skoda Works of what was formerly known as the United Engineering Works, Ltd., consisting of the factories of Ruston, Bromovsky and Ringhoffer. The factories, which are engaged in the manufacture of finished machinery, always worked in close conjunction with the Skoda Works under a kind of mutual agreement whereby Skoda received much of its machinery practically at cost in return for supplying the United Engineering Works with forgings, castings and semi-finished parts at basic prices. The combination, therefore, is merely to consolidate under one head the two essential parts of what had long ago become in fact a single industry. Its importance for the Skoda Works lies in the fact that to this extent it has now become a self-sustaining entity. It is fair to assume that without these essential facilities such as Fig. 8 shows to be at hand in the machine shops, the Skoda Works could never have branched out alone to include the various undertakings in which it finds itself today, and thus would have been compelled to reduce its working force instead of adding to it as it has.

Size of Working Force

The increase in the working force of the Skoda Works, it should be added, is only as compared with pre-war times. Compared with the war, when every available man and machine was working at the maximum, or even compared with two or three years ago before the post-war boom had entirely lost its impetus, the number of workmen employed in all the shops is found to have been materially reduced. On the other hand, the year immediately following the war, during which the greater part of demobilization and repatriation took place, saw only a reduction of from 40,000 to 22,000, while the further reduction since that time, affecting only Czecho-Slovak working men, brought the total number down to 17,000. Even this, however, represents an increase of approximately 7,000 over 1914, and to that extent indicates the spread of Skoda's enterprise.

Wages, which reached their highest point in May, 1922, have been reduced about 30 per cent within the past twelve months, the average workman now receiving 5 crowns an hour for his labor. In contrast with the day scale still in vogue in many German factories, it is interesting to see that 70 per cent of the workers in the Skoda plants receive their pay by piecework, the remainder being only helpers and apprentices. This condition exists too in spite of the fact that Czecho-Slovakia is supposed to be a socialistic republic and that the trade unions are more strongly organized here than in almost any other part of Europe.

Industrial and Labor Associations

For the most part the organization of the workers is welcomed by the employers, who also have their own association, the Czecho-Slovak Federation of Industries. It has become easier to deal with the demands of labor in the mass and it is said to be possible in this way to compel the unions to acknowledge some sort of responsibility to the State and to the public. In the event of industrial disputes the Minister for Social Welfare is frequently called in as a conciliator, but he has no powers to enforce his rulings and neither has the Board of Arbitration set up by the Government. However, when factories are reducing their production, labor is not so apt to cause trouble as in times of general prosperity. Consequently the system is still to come to trial. Skoda, fortunately, has been singularly free from such disturbances.

Even more fortunately, it has been free from the shortage of coal and other raw materials from which Germany, Austria and Hungary especially are suffering. Only coke coal has been somewhat hard to get; but, since this is the only product of which Germany has no lack, the latter country has been glad to exchange her surplus for the bituminous coal of Czecho-Slovakia of which, especially since the occupation of the Ruhr, she has been in such desperate need. Iron ore is plentiful in Czecho-Slovakia, but its general quality, because of the high per cent of silica it contains, makes it difficult to convert into the durable, high grade steel which is the Skoda standard. The maximum amount of silica which can be permitted in iron ore for steel manufacture is 6 per cent, whereas the average in that mined in Czecho-Slovakia often reaches as high as 15 per cent. As a result, Styrian or Swedish ore is generally mixed with the native iron to obtain the proper quality.

At the same time, the presence of natural resources on a large scale has not kept the Skoda Works from developing a more efficient use of fuel, and in the matter of electrification especially it is far ahead of most of the industrial centers of the country. Fully half the current of the Pilsen plant is obtained directly from a mine owned by the company not more than 7 miles outside of town in Nyrany, where there is also a small plant. Other mines in less accessible territory are also owned by Skoda, and it is the declared intention of the engineers to link these up as well in time so that all the shops of the company will be run by power transported over wires instead of by railroad freight.

Future Development

What will probably happen if conditions are ever restored to anything like normal in Europe is that Skoda will be discovered to have grown from the most important machine factory of Austria and Czecho-Slovakia into one of the four or five most important in the world. Not merely the nucleus but the foundation and the framework are already there. This is a fact of which business circles do not yet seem quite aware, as may be seen by the following translation of a comment by the

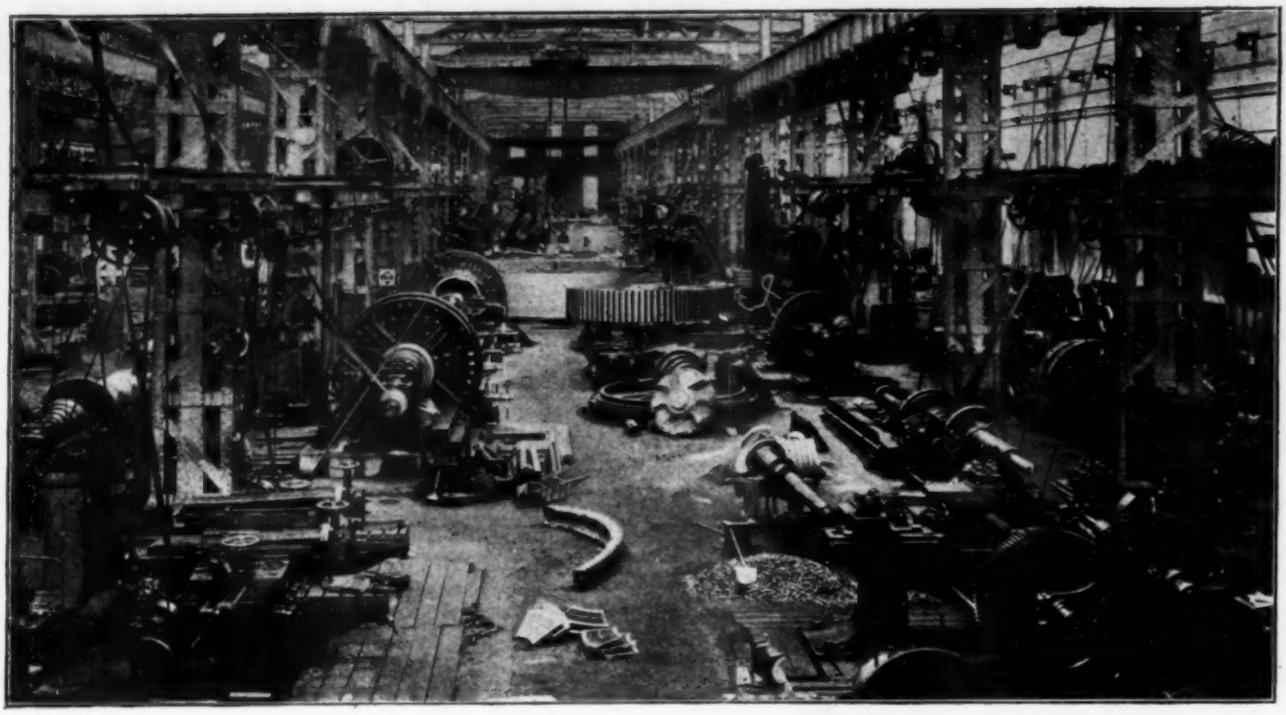


FIG. 8—MACHINE SHOP AT SKODA WORKS

financial expert of the *Wiener Journal* of Vienna—certainly not apt to exaggerate the prosperity of its lost province—which appeared in the issue for Feb. 13 last.

"For some time past the stock of the Skoda Works and Poldihütte has been widely advertised and boosted in financial circles, with due regard for the present money shortage, but without success. For a better understanding of the matter, it should be pointed out that both companies are undoubtedly bound to profit as a result of the existing tension in Europe and in Asia, chiefly because of the fact that, regardless of whether a general European conflagration occurs again or not, they are receiving sufficient important orders now to tide them over the period of industrial depression. According to a recent dispatch of the *Russpress*, which is characteristic of similar reports: 'The Skoda Works in Pilsen today are receiving orders continuously in such great numbers that it will be entirely unnecessary for them to reduce in any degree the present number of their workers.'"

There are not many factories outside of Germany of which the same thing could be written.

The Use of Machinery Export Statistics

By W. H. Rastall

Chief of the Industrial Machinery Division, Department of Commerce

If a machinery manufacturer could be provided with accurate statistics showing the destinations to which American machinery of the types he produces has been shipped, this information would undoubtedly be a very great help in making plans for foreign sales. For many years the Government has been conscientiously striving to so collect and distribute this information that it would be dependable, explicit, and timely, but the published figures have often been severely criticized.

In an effort to remedy defects in the returns, a change was made in the method of handling these statistics on Jan. 1, 1922, and for the first time figures were collected showing not only the value of the exports to each destination, but also the quantity. Instead of merely reporting that so many dollars' worth of lathes were shipped, say, to Japan during a given interval, an effort was made to show also the number of lathes included in this value.

This new practice soon developed the fact that these export returns were in some cases palpably inaccurate. For example, a centering lathe chuck was reported by its shipper at a value of $3,800, and Diesel engines at a value of $60, both of which are hard to picture to the imagination. Such engines are not usually so cheap nor are lathe chucks so expensive. Hundreds of similar examples could be cited.

Special investigations made to ascertain how figures such as these creep into the official statistics have shown that, in this particular, the Government is absolutely in the hands of the exporters, since these statistics are compiled from the export declaration accompanying each outbound shipment. At any important custom house these declarations are received in such large numbers as to make it impracticable for the customs authorities to verify the accuracy of each item. If the export declaration is inaccurate the Government figures based thereon will necessarily be inaccurate also.

One way in which inaccuracies can creep into these export declarations is through the practice of certain manufacturers of delegating the preparation of the declaration to freight forwarders, export merchants, or others, who turn the task over to a subordinate clerk having no accurate information regarding the commodity involved.

Excerpts from Trade Information Bulletin No. 139.

Ideas from Practical Men

Devoted to the exchange of information on useful methods. Its scope includes all divisions of the machine building industry, from drafting room to shipping platform. The articles are made up from letters submitted from all over the world. Descriptions of methods or devices that have proved their value are carefully considered, and those published are paid for

Overhanging Gear Drives

By J. T. Towlson
London, England

The overhanging gear drive shown in Fig. 1 is a regular part of a machine well known upon the English market.

I do not like this drive for the reason that both

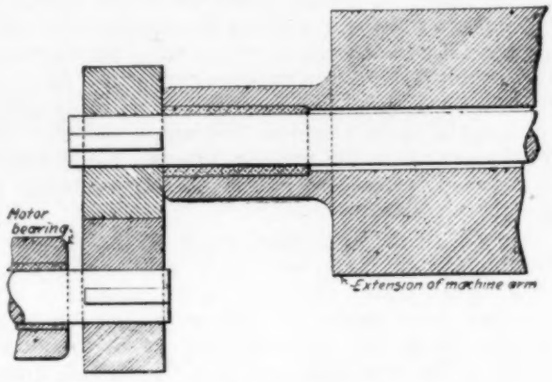


FIG. 1—THE ORIGINAL DRIVE

driving and driven shafts are unsupported at the outer end, thus imposing greater pressure upon the bearings and increased bending strains upon the respective shafts. This condition tends to wear out the bearings

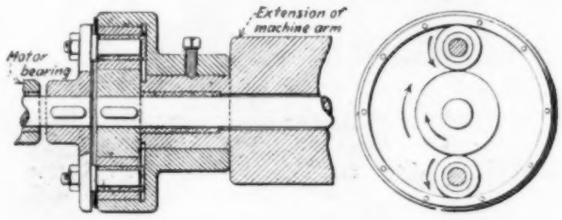


FIG. 2—THE PLANETARY ARRANGEMENT

quickly and is also likely to cause distortion of the shafts, with consequent gear noise and loss of power.

In Fig. 2 I have shown, diagrammatically, a planetary gear arrangement that I have substituted for the first mentioned drive. In this form the driving and driven shafts are brought into the same line and the bending strains are balanced by introducing intermediate pinions on opposite sides of the driving and driven gears. Though the drawing shows but two pinions, three would be better; spacing them 120 deg. apart.

Two objections may be raised to this form of drive; one being that it is expensive to make and the other that it interferes with the speed ratio between driving and driven shafts. I believe that the extra cost of this construction is more than offset by the saving in maintenance, while the second objection can easily be overcome by a proper calculation of the relative gear sizes.

Another method shown in Fig. 3 is, perhaps, less expensive than the planetary arrangement and is a very satisfactory solution. It does not balance the

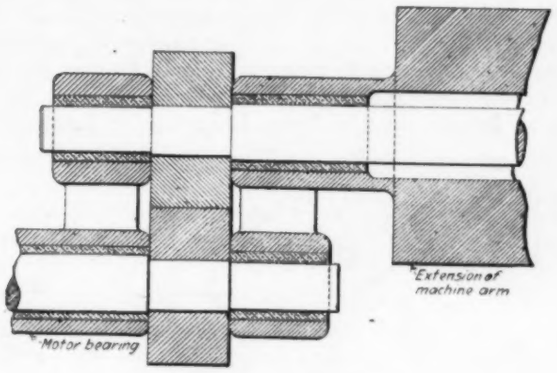


FIG. 3—ANOTHER METHOD

stresses but it provides ample and proper means of sustaining them, thus reducing the wear upon the bearings and the likelihood of bending the shafts.

I would like the opinion of other engineers as to the relative merits of the various constructions.

Extension Shanks for Small Drills

By J. F. Cavanagh

Small drills with extra long shanks are often very convenient but are not always available. It is an easy matter, however, to provide an extension for a small drill in the following manner. Take, for example, a $\frac{1}{4}$-in. drill. Cut a piece of $\frac{7}{16}$-in. drill rod of the required length for a shank extension and drill a $\frac{1}{4}$-in. hole about $\frac{1}{2}$ in. deep, centrally in one end. Make a fine saw-cut not quite half way through the rod at the bottom of the hole and another $\frac{1}{8}$ in. nearer the end. Grind a flat portion about $\frac{3}{32}$ in. long on the end of the drill shank. Insert the drill in the extension and with a drift or center punch, force in the portion of the shank extension between the saw-cuts so it will engage the flat portion

EXTENSION SHANK FOR SMALL DRILL

of the drill. The sketch shows the extension with drill removed. Such extensions are quickly made and are serviceable. Flatting the drill shank, as shown, does not impair the usefulness of the drill. It will be seen that modifications of the above dimensions should be made for other sizes.

Milling Hexagon Shapes

By Francis M. Weston, Jr.

When a large number of pieces require to be side-milled as in the milling of the hex on the gas-engine valve guides shown herewith, the cost of production can be more than cut in half by milling seven pieces at once by the use of the simple fixture illustrated in the accompanying drawings. This method is particularly applicable in small shops where special machinery for quantity production of such work is not available.

This fixture consists of a cylindrical block threaded to suit the dividing head of a milling machine and bored to take the seven pieces—one in the center and the other six grouped around it on the points of a regular hexagon—see Fig. 1. Four side-milling cutters are set up on the arbor of the machine and travel in the paths *A*, *B*, *C* and *D*. Three runs of these cutters clear across the work, which is indexed 60 deg. for each cut, completes all seven pieces.

For laying out the large hexagon for locating the

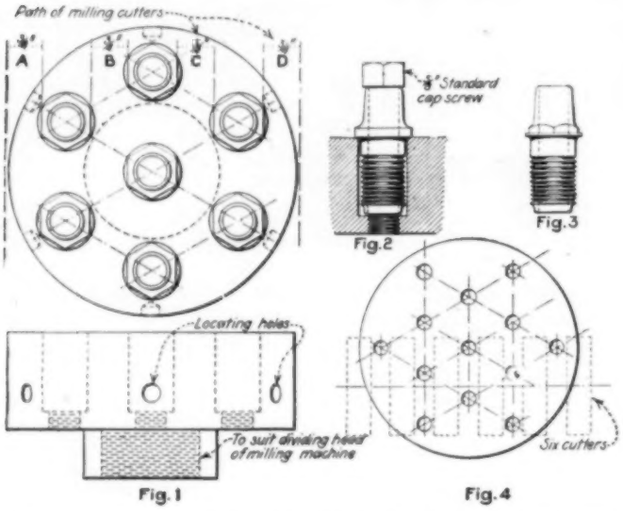


FIG. 1—FIXTURE FOR MILLING HEXAGONS ON SIX PIECES. FIG. 2—METHOD OF HOLDING PIECE TO BE MILLED. FIG. 3—PIECE WITH HEXAGON MILLED FIG. 4—FIXTURE FOR MILLING HEXAGONS ON THIRTEEN PIECES.

seven pieces it will be noted that the radius of the inscribed circle of the hexagon formed by lines passing through the center of the outer row of pieces, is the sum of the width of one of the cutters selected plus the width across flats of the hexagon of one of the pieces to be milled.

When the pieces to be milled have a central hole, as in the case of the valve guides, they can be secured to the fixture as is shown in Fig. 2, where a guide ready to be milled is shown secured by an ordinary capscrew. Fig. 3 shows the finished guide. For other kinds of work, suitable methods of securing must be devised.

The saving in cost of operation by this device over milling one piece at a time is more than 50 per cent. The cost of milling the hexagon on valve guides was reduced from about five cents to a little more than two cents each, in lots of one hundred or more. This latter figure covers time consumed in setting up the cutters and the setting up and taking down of the pieces to be milled. The saving on the first two hundred pieces paid for the making of the fixture, and all later work resulted in a real economy in the shop expense. A slight further saving could have been affected by selecting thinner cutters for the work, as the pieces could then have been grouped closer together and the proportion of waste travel to working travel of the cutters would have been reduced.

Shapes other than hex can also be milled in groups with an appreciable saving of time by arranging them in some similar suitable form.

When the number of milling cutters of the same size on hand is sufficient, and the arbor of the milling machine is long enough to accommodate six of them, a further saving of time can be effected by arranging the fixture and cutters as indicated in Fig. 4 for milling thirteen pieces at once.

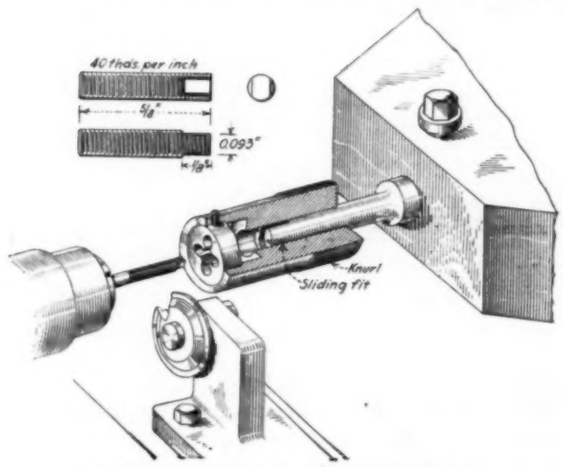
Combined Threading and Broaching Tool

By J. P. Housley

A small setscrew, threaded over the whole length and flatted on two sides for a short distance at one end to take a special socket wrench, was costing altogether too much to manufacture, for the reason that the flats were milled after the threading was done and the threading die had again to be run over the screw to remove the burrs thrown up by the milling cutters. We eliminated these two operations by means of the combined tool shown in the sketch.

A broach, to cut the metal away at the end of the screw to form the flats, was made with a shank to fit the hole in the turret of the screw machine upon which the screws were made. A holder to take the round adjustable threading die was made to fit freely over the body of the broaching tool, and the outside knurled to enable the operator to get a good grip upon it with his hand.

In operation, the turret would be moved forward



A BROACHING AND THREADING TOOL

until the die was nearly in contact with the wire as the latter was held in the collet. The operator would then move the die-holder forward (over the body of the broach) and run up the thread on the wire to the required distance. Stopping the machine, he would then move the turret up against a fixed stop, thus broaching the flats on the end of the threaded wire.

Now moving the turret back to clear the broach from the wire, the machine would be reversed and the die run off the thread, removing the burrs left by the broach in its passage. The cut-off tool then severed the piece from the wire and completed the screw, ready for inspection, in one operation.

Reading the *American Machinist*

By E. V. Allen

There are numerous schemes in use in order to make it possible for several shop men to read a single copy of the *American Machinist*. One of the best I ran across a few days ago, and the form slip that is pasted to each

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CIRCULATING SLIP FOR THE "AMERICAN MACHINIST"

copy of the magazine as it arrives at the shop office, is reproduced herewith.

Special attention is called to the one-day limit for each man after which he passes the copy to the next man on the list. Also to the fact that the men are not to clip or tear out articles or advertisements, but instead they mark articles in which they are interested and after all on the list have read the paper, the articles are clipped and filed in the office, where they are easily accessible to anyone interested.

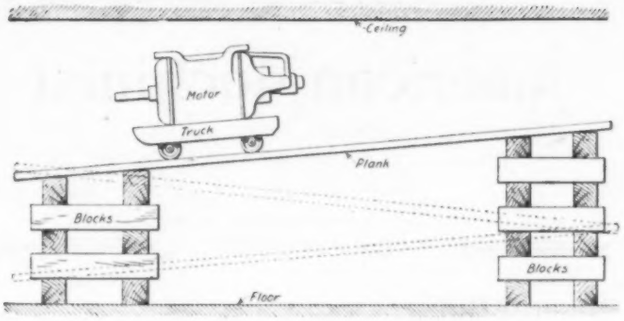
Putting a Motor on the Ceiling

By I. B. Rich

Putting a motor on the ceiling gets it out of the way, but it gives the millwright a bad job unless the shop has a portable elevator that can lift any reasonable weight and hold it while it is being fastened. A block and tackle doesn't help a bit, as it cannot get the motor up to the ceiling and hold it there unless you rig two hoists, one on each side, and lift between the two.

Here is a stunt I saw in the new shop of the Pioneer Instrument Co., in Brooklyn, N. Y. They had a small four wheel truck for moving heavy boxes and took that to carry the motor. They laid the motor on the truck with its feet up, as shown. Then they took two planks, one for each set of wheels on the truck and made them into an inclined plane by blocking up one end.

Running the truck to the high end they blocked up the other end to double the height, and ran the truck back again on the plank. Repeating this process of blocking



RAISING A MOTOR BY INCLINED PLANKS

up first one end and then the other, they rolled the motor up into place and bolted it to the ceiling without difficulty, or using hoisting apparatus of any kind.

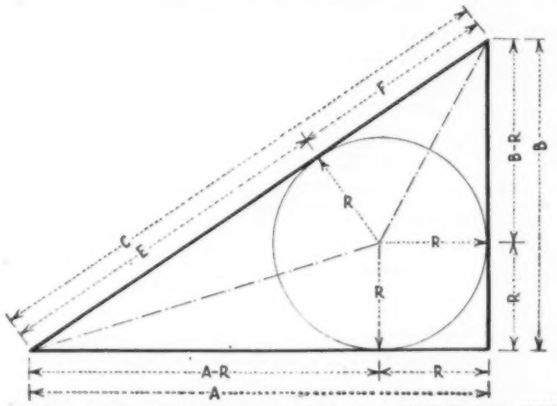
The motor was 5-hp. and too heavy to handle without special equipment or some make-shift of this kind. It was not hard to work and the only precaution necessary was to prevent the truck from rolling back down the planks or from getting out of control. But the work was done without a hitch and in good time.

Diameter of an Inscribed Circle

By Edward Heller

An interesting problem came up a short time ago in our shop. We had some triangular bars that had to be supported on round bearings, and it was desired to turn the ends so as to produce the maximum diameter. Now, while we could determine the diameter fairly closely by laying it out, it was found that no one around the engineering department could, off hand, give a theoretical formula for the diameter of the turned ends.

The writer looked through a number of geometry books in the hope of finding a proposition or problem



FINDING THE DIAMETER OF THE LARGEST BEARING THAT CAN BE TURNED ON THE BAR

that would suit this case, but it was all in vain. A solution was finally hit upon by starting from the finished job and working backwards.

Denoting the sides by the letters A, B and C and the radius of the required circle by R, we get

$E = A - R$ and $F = B - R$.

But $E + F = C$

$\therefore A - R + B - R = C$

$A + B - C = 2R =$ diameter of the bearing.

In our case the bars were such that $A = 2\frac{1}{2}$ in. and $B = 3\frac{3}{8}$ in. This gave about 4.2 in. for C, and

$$D = 2\tfrac{1}{2} + 3\tfrac{3}{8} - 4.2 = 1.675 \text{ inches.}$$

American Machinist
Established 1877
KENNETH H. CONDIT AND FRED H. COLVIN
Editors

October 4, 1923

Minority Rule in the Shop

THE MANAGER of a shop building twelve sizes of water pumps, six sizes of oil pumps and three sizes of some other pumps, all of them in nine different styles and with a variety of drives and attachments, looks with envy at his neighbor across the street who manufactures articles in quantities, *real* quantities. He feels, that if he could build his pumps in lots of 10,000 or more, most of his troubles would disappear and his costs would appear as if he were looking at them through the wrong end of a telescope.

The neighbor across the street looks at it in a somewhat different way. He will tell you that for every article of which he makes 10,000 there are a hundred of which he makes only one or two or a dozen.

If a method is suggested for cutting costs, he'll point to the thousand and one small quantities which are taking the joy out of his life. Such methods are all right, he says, for his neighbor across the street who makes only a few varieties of pumps, but not for a shop which makes literally thousands of articles. Therefore he continues to employ the old methods.

There are so many small orders, each with its own troubles, there are so many small quantities which require as much clerical labor and supervision as if they were large, that he loses perspective. If he only would gather some figures he might see that all the small quantities together, figured in dollars and cents, are not twenty per cent of his business. The other eighty per cent or more are of large quantities. If he does so he'll conclude that his interest lies in the eighty per cent, that these eighty per cent make the profits and deserve to be studied, that it may be wise to devise better methods for them, buy better equipment for them and that the twenty per cent should not be permitted to dominate his policy.

Assembling on Moving Belts or Chains

THE INTRODUCTION of methods whereby the machine being assembled is moving, either on a belt, a platform or a chain-drawn jack or carriage, has a psychological effect which many overlook. Originally brought into use in shops where large production was necessary, it has found its way into plants where the product is of the highest grade, and with good results.

There are many accustomed to the older methods who feel that every man on a quality job should be urged to take his time. They cannot understand how quantity and quality can go together. But we have many modern examples that this can be done. In fact many trade and vocational schools are teaching that the aim is quality first, and then faster production of that quality.

The effect of introducing the moving belt in assembling or in other operations is to unconsciously speed up the work. Even though no one says a word the constantly moving work is an incentive to more rapid motions. It is like a pacemaker in a race, or the keeping of a pile of work to be done beside the machine.

There is, however, a limit to the speed at which the moving of work will be efficient. It can frequently be increased far beyond what was originally believed possible. But let it be speeded even a little beyond the maximum speed for the average worker, at that time at least, and the output decreases noticeably. Possibly in another generation this may be the normal speed but at present there seems to be a very definite limit depending, of course, on the work and the workers.

The urge of moving assembly, however, can be applied successfully in many places, even where the quality of work desired is very high. It is being so used in some of the best plants today with good results. It is worth careful study by all production engineers.

One Reason Why Men Are Hard to Get

FROM ALL parts of the country comes the similar tale regarding the difficulty of getting good men in the shops. Employment managers who were thrown into the discard with other war time expenses as soon as labor became plentiful, are again being hired and we hear once more of the importance of personnel work.

But it will be more difficult to make this sort of talk effective than it was before. The wise employer who really believes that personnel work is important does not use his employment solely as a recruiting establishment when business is brisk.

Disturbing features of the situation are that boys no longer flock to the machine shop to learn the trade and that good mechanics are going into other lines of work. There is no use in laying this state of affairs to bolshevism or any other bogey. The answer is the same as though we asked why men who used to be law abiding citizens are now playing in the bootlegging game. There's more money in it—and the mechanic is perfectly within his legal rights.

There is no use in trying to fool ourselves as to the reason. Many other industries pay better wages and have shorter hours. When a good machinist who may get 70 cents an hour in some shops, can earn twice this as a carpenter or bricklayer, and with only a fraction of the skill formerly required, can he be blamed for changing jobs?

Of course it is easy enough to say that the carpenter or bricklayer gets too much. Perhaps he does—but as long as he gets it, what we may think about it makes no difference. Other industries compete with our own and frequently win. Unless a man or a boy has the love of the shop born in him, he can hardly be blamed for going where there is the most money. If we want to hold men we must study the problems of wages and particularly of interesting men in their work, more carefully than we have done in the past.

Now for the Machinery Bloc!

By FRED H. COLVIN
Editor, *American Machinist*

A friend of mine's a farmer,

who raises winter wheat, and though he has a bumper crop, his joy is not complete. The market's full, the price is low and all the soil he tills, don't raise enough in ready cash to pay his current bills. But he's most hopeful just the same, that things will be O.K. He is sending men to Congress who will do the things he'll say. He's got his eye fixed on a star, he's firm as any rock, on all the things he's going to do with this here farmers' *bloc*.

He says to me,

"You're foolish, Bill, that you don't do the same. You've got a lot of solid men to put into the game. Just send them down to Washington where *blocs* are growing fast and soon you'll have your troubles nailed, plumb tight against the mast.

"Now here's a tip,"

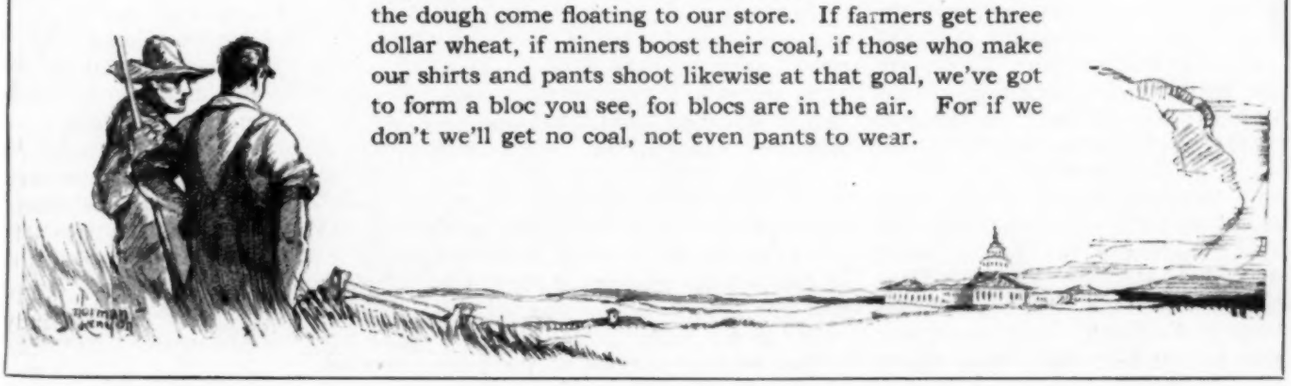
he says again, "and take it straight from me, our *bloc* will help you put it through, it's what we'd like to see. You build machines of every kind that make the things we need, like reapers, motor cars and such, that save a horse's feed. Without them, Bill, we'd work like hell, just please excuse the swear, and you can bank on our support to see you're treated square.

"So drop your anxious tone of voice,

likewise your worried mien, get busy with your special blocs to boost your own machine. Be sure you pick your fighting men, men whom no storm can rock, then you'll be safe, protected by, the *great machinery bloc*."

This farmer friend has got the dope,

why should we worry more, let's form a bloc and watch the dough come floating to our store. If farmers get three dollar wheat, if miners boost their coal, if those who make our shirts and pants shoot likewise at that goal, we've got to form a bloc you see, for blocs are in the air. For if we don't we'll get no coal, not even pants to wear.



Shop Equipment News

Henry & Wright "Viktor" Drilling Machine

The Henry & Wright Mfg. Co., Hartford, Conn., is marketing a new series of production drilling machines to be known as the "Viktor," that embodies several interesting features in design and construction.

The column of the machine shown in the accompanying illustration is in two sections. The lower part, or pedestal, contains a tank for the drilling compound and is fitted with a door through which the tank may be removed for cleaning. The suction pipe from the pump and the discharge pipe from the table to the tank are of armored flexible tubing, so that no pipe joints need be loosened or other connections disturbed in order to get the tank out.

At the upper end of the pedestal are closed pockets, cored in the casting, to hold lubricating oil. The transverse shaft, through which the power of the motor is transmitted, passes horizontally through these pockets so that the ball bearings on which it runs and the bevel gears that transmit the power to the central vertical shaft are at all times partially submerged in oil.

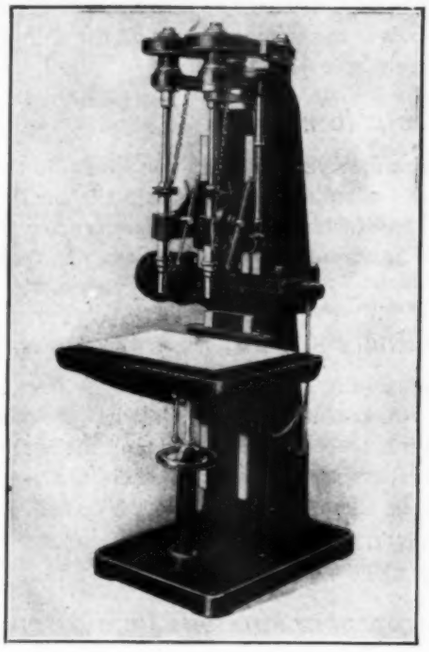
The vertical shaft passes through the upper part of the hollow column in which it is supported by ball bearings, and to its lower end is keyed the second member of the pair of driving bevel-gears. At the upper end, just above the column, a flanged pulley to receive the spindle driving belt is similarly fastened.

Upper Part of the Column

This part of the column also houses the counterweight that balances the drill spindle. To prevent the weight from coming in contact with the central shaft the latter is further enclosed for nearly its full length by a rigid tube.

When the upper part of the column is bolted to the pedestal, both the drive shaft and the vertical shaft with their attached gears and bearings are enclosed within a chamber that is practically dust proof, and that also protects them from injury.

The drill spindle is driven from the central shaft by a 2 in. belt passing over flanged pulleys. Four pairs of pulleys are provided for each spindle, and these pulleys may be interchanged in the same manner as the change gears of a lathe to provide different speeds for the spindle. A spring-suspended idler maintains a constant tension upon the driving belt without reference to the ratio of the pulleys employed, so that one endless belt serves for all pulley combinations.



"VIKTOR" DRILLING MACHINE

The table is in the form of a rugged knee, gibbed to slide vertically upon the face of the column. It is centrally supported by an elevating screw of substantial size, by means of which it may be adjusted for height. The distance from the chuck jaws to the surface of the table ranges from zero to a maximum of 27½ in., 6½ in. of which is covered by the vertical traverse of the sleeve and the remainder by the adjustment of the table.

The working surface of the table is 16 in. square in the single spindle machine, with proportionately increasing length as additional spindles are included. The center distance of the multi-spindle machines is uniformly 9 inches. The table is surrounded by a wide and deep channel to collect the used compound.

Mounting of the Motor

The 1 hp. motor is permanently bolted to the side of the column and the horizontal driving shaft is, in effect, an extension of the motor shaft. A geared pump, constructed entirely of bronze and capable of delivering 4 gal. per min. of compound, is keyed directly to the opposite end of the shaft so that no belt or gear reduction intervenes between motor and pump, and but one pair of bevel gears and the driving belt between motor and drill.

Hand or power feed may be applied independently to each spindle. Power for the latter is obtained through enclosed change gearing directly from the drill spindle. The power feed may be set to release at a predetermined point and return, or may be allowed to operate continuously.

The machine as a whole is rigid and compact, and is designed to withstand rough treatment. The floor space occupied is 22x32 in. and the machine stands 78¼ in. high. The net weight of a single spindle machine is 820 lb., and proportionately greater as the number of spindles increases. Drilling speeds available with the four pairs of pulleys ordinarily furnished range from 339 to 2,818 r.p.m. Feeds of 0.004, 0.008 and 0.012 in. per revolution may be obtained with the regular gearing, and coarser feeds up to ⅛ in. by means of special gears. The machine will drive a ¾ in. drill, and can be furnished with one, two, three, four, six or eight spindles.

The ability to maintain high-speed and continuous operation under heavy load makes the machine particularly suitable for production work. The simplicity of the machine and the attention paid to details that tend to give long life are features especially stressed.

Crescent Metal Cleaning Machines

The Crescent Washing Machine Co., New Rochelle, N. Y., has recently made some additions to the line of metal cleaning machines which it manufactures. These machines employ the same design of revolving wash units used on the other machines made by this company and pactness of the machine fits it for use in small metal cleaning departments, at the end of a line of automatic screw machines, or in other places where floor space is limited.

The washing compound tank has a capacity of 75 gallons and can be heated by steam, gas or electricity.

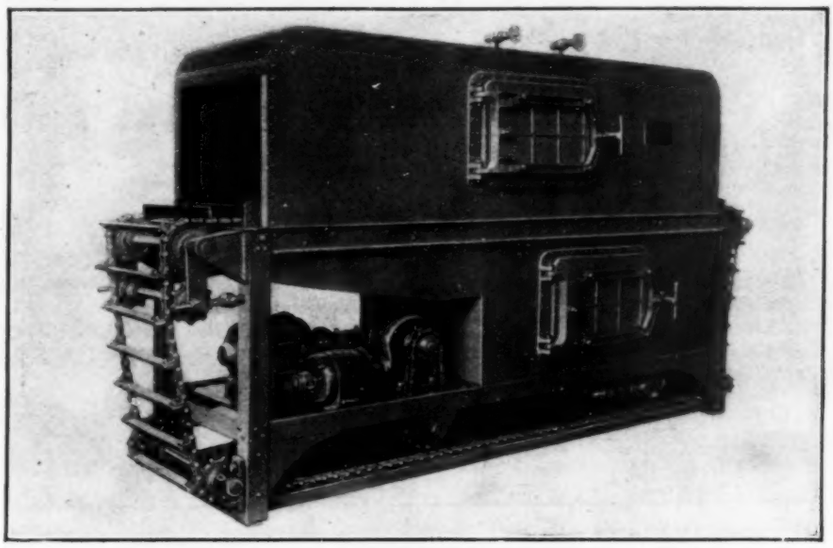


FIG. 1—CRESCENT MODEL 1A METAL CLEANING MACHINE

previously noted on page 314, Vol. 57, of the *American Machinist*.

The Model-1A machine is illustrated in Fig. 1. This is the smallest size automatic metal washing machine in this line, and it is claimed that it will do the work of four men using other methods. It will wash metal parts up to 18 in. wide by 14 in. high, such pieces being placed directly on the conveyor. Racks are used for smaller pieces. The com- A 1½-hp. motor drives the pump and a ½-hp. motor furnishes power for the conveyor, which can be run at various speeds. This machine weighs 2,250 lb. and a larger size, known as the Model-2A weighs 2,550 lb. The latter model will handle pieces up to 26 in. wide.

The rotary drum type shown in Fig. 2 employs a perforated cylinder to handle parts instead of a conveyor. The drum turns the parts over and over, exposing all surfaces to the wash which streams through the perforations from above and below. One man can handle this machine, the parts falling into a tote box or other receptacle as they come out of the drum after the cleaning operation.

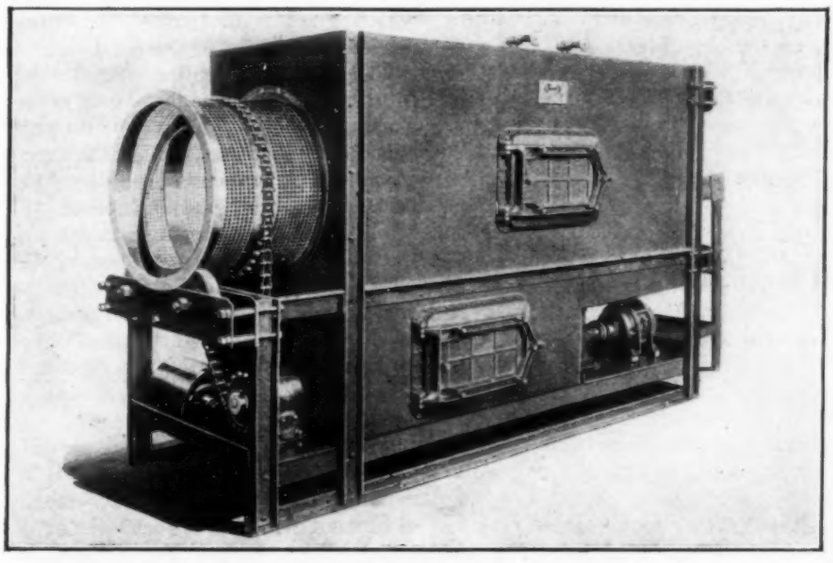


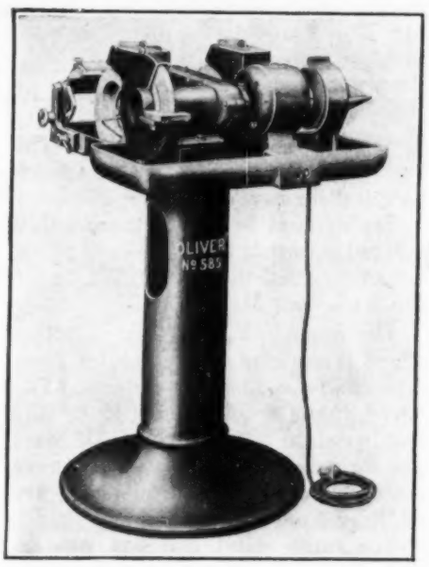
FIG. 2—CRESCENT DRUM TYPE METAL CLEANING MACHINE

Oliver Oilstone Grinder

A grinding machine for sharpening turner's chisels and tools, gouges, knives, and other woodworking tools, has recently been placed on the market by the Oliver Machinery Co., Grand Rapids, Mich.

The machine is equipped with two oilstone wheels which are kept constantly saturated with kerosene or other oil. The oil flows from the center of the wheels by centrifugal force and capillary action. The wheels are guarded and are arranged with a table which acts as a tool rest. and carries a sliding tool holder.

The tool holder has a micrometer



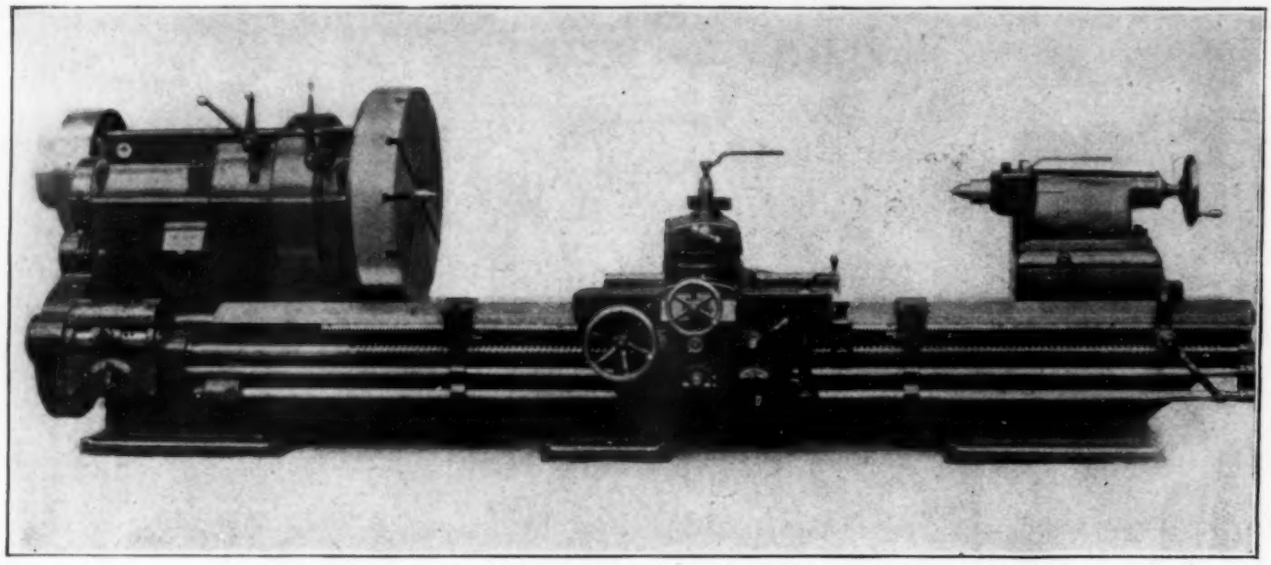
OLIVER OILSTONE GRINDER

feed so that irregular shaped tools can be accurately ground. An emery cone and a leather stropping wheel are mounted on one end of the motor shaft, and the shaft is flexibly connected at the other end to a general utility grinding wheel provided with a suitable tool rest. The oilstone wheel shaft is geared to the shaft of the general purpose wheel.

All shafts run in ball bearings. The motor and its direct-connected wheels run at 1,800 r.p.m., the oilstone wheels rotating at 300 r.p.m. The motor can be furnished for direct or alternating current and may be connected to a convenient lamp socket.

Le Blond 30- and 36-inch Heavy Duty Geared-Head Lathes

Two larger sizes, 30- and 36-in., have been added to the line of heavy duty, geared-head lathes manufactured by the R. K. LeBlond Machine Tool Co., Cincinnati, Ohio. The 36-in. machine is shown in the accompanying illustration.



LEBLOND 36-INCH HEAVY DUTY GEARED HEAD LATHE

The general design of these lathes is similar to that of the 25- and 27-in. sizes described on page 90, Vol. 58, of the *American Machinist*.

The headstock is of the selective speed type, 16 speeds ranging from 4 to 255 r.p.m., being available. The speed changes are produced by the manipulation of two levers. All gears are forged and heat-treated and have stub form teeth. Sliding gears are of chrome nickel steel.

The single driving pulley runs at 500 r.p.m., and is 24 in. in diam. A belt 6 in. wide is used. The forged crucible steel spindle has a 2¼-in. hole and No. 6 Morse taper centers are used. The headstock gearing and bearings are automatically oiled by a geared pump system.

The bed is deep and heavy and of length to suit the service required. The back carriage bearing is flat, the front shear being V-shaped to resist tool pressure in all directions. Both bed and carriage are of semi-steel. The tailstock is similar to those furnished with the smaller sizes and is equipped with a rack and pinion device for quick movement.

The carriage apron is cast in one piece, and is of the double-wall type in which all studs and shafts have a bearing at each end. Both feeds are operated by a single positive clutch.

The leadscrew has 1 thread per in., and the quick change gear mechanism gives a range of 48 feeds and speeds. The leadscrew is not splined, a separate feed rod being provided. Special coarse leads and metric threads can be cut by applying gears at the end of the box.

The 36-in. lathe swings 38½ in. over the shears and 29 in. over the carriage, the swing of the 30-in. machine being 32½ in. over the shears and 22¼ in. over the carriage. The usual standard equipment is provided.

Arrangements for motor drive can be made, the motor being mounted on a bracket and driving through a belt, or mounted on the head and geared to the drive shaft. For the larger lathe a 15- to 25-hp. motor is required, and for the 30-in. size a 15- to 20-hp. motor is sufficient.

The 36-in. machine weighs 16,200 lb. net with a 12-ft. bed, the smaller size weighing 13,200 lb. with a 10-ft. bed. Various bed lengths can be furnished as desired.

Foote-Burt Multiple Spindle Boring Machine •

For use in boring and reaming automotive cylinders, and for miscellaneous boring operations on other work, the Foote-Burt Co., Cleveland, Ohio, is now marketing a multiple spindle boring machine.

The new design represents an improvement over the machine previously manufactured by this company for this purpose, one of which was described on page 38, Vol. 39, of the *American Machinist*. The present machine is intended for production work on parts that are to be machined in quantity and, for this reason, the spindles are set on fixed centers and the speeds and feeds are worked out to suit the particular job.

Either belt or motor drive may be provided, the machine shown in the illustration being motor-driven. The main driving shaft in the head is driven through reduction gears from the motor, and carries two worms which mesh with two worm wheels on vertical shafts in the head.

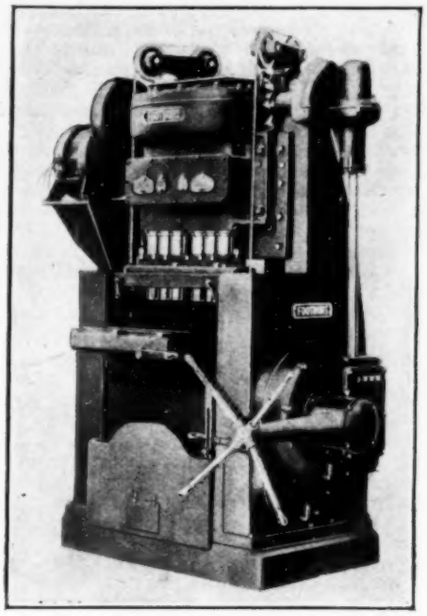
The boring spindles are divided into two groups, one worm wheel shaft driving each group through suitable spur gearing. The spur gears which drive the spindles have both coarse and fine pitch teeth, the intention of this arrangement being that the coarse teeth will carry the heavy load, the finer teeth producing smoother action. The head gearing and bearings are oiled by a force feed system, a geared pump for the purpose being mounted at the rear of the head crossrail.

The head occupies a fixed position and the feed is accomplished by raising the work table. By means of change gears, four feeds are available. The change gears transmit power from the drive shaft to a

vertical shaft which drives the feed pinion shaft through a worm and worm wheel. The feed pinions mesh with vertical racks located at either side of the table.

The worm is normally held out of engagement with the worm wheel by means of a spring. It is thrown into engagement by a hand lever and locked with a trigger. At the end of the operation the worm may be tripped out of engagement by hand, or an automatic arrangement on the machine may be used. The capstan wheel is used for hand feeding.

In this design all gears are enclosed and the machine is somewhat more compact than before. The spindle heads and jig plates may be changed for various jobs.

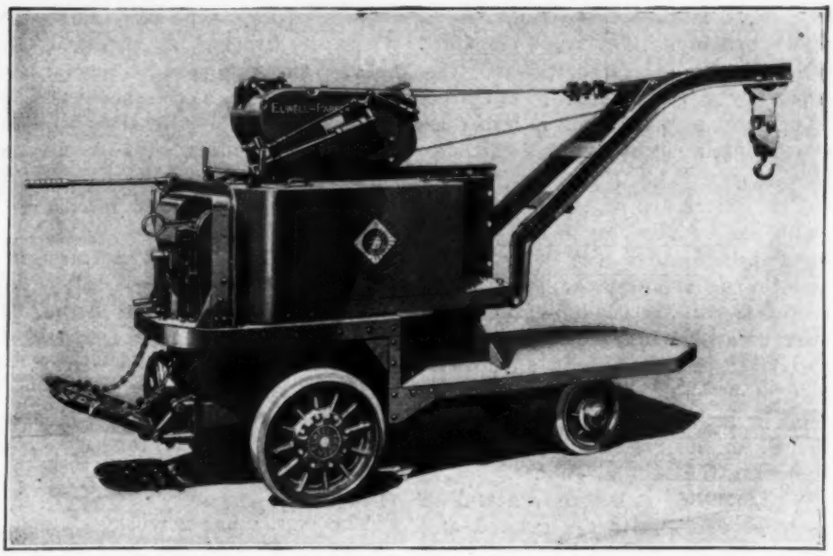


FOOTE-BURT MULTIPLE SPINDLE BORING MACHINE

Elwell-Parker Electric Crane Truck

The electric crane truck recently placed on the market by the Elwell-Parker Electric Co., Cleveland, Ohio, has been developed especially for use in the railroad general storeroom. Since it will tow, carry, lift, stack, lower, or push material or other movable equipment about, it should be a useful tool for the general storekeeper.

The crane consists of a lifting unit, power plant and battery, counterbalancing the boom. This apparatus is mounted on a steel column with a heavy base which is anchored to the steel frame of truck. Wide-gage axles are provided.



ELWELL-PARKER ELECTRIC CRANE TRUCK

There are two drums in the hoisting mechanism, one of which raises and lowers the boom, the other handling the hook. The drums are driven by a single motor through worm gearing, but each drum may be operated independently. Each drum is fitted with a plow steel cable $\frac{3}{8}$ in. in diameter.

The unit is moved from point to point by means of an electric motor, located just back of the crane column, and connected through worm gearing to the driving axle. Both motors receive power from the battery which swings with the boom, the leads for the driving motor passing down through the column.

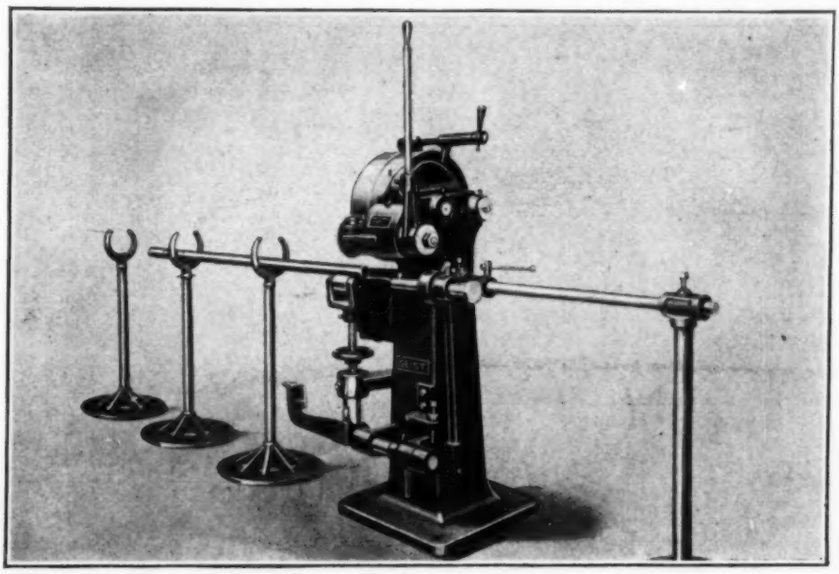
A separate controller is provided for each motor. The wheels on the forward axle have 15x3½-in. solid rubber tires, the driving wheels being provided with 22x4½-in. tires. All four wheels steer.

Geist Roller Pipe Cutter

The Landis Machine Co., Waynesboro, Pa., is now marketing a heavy duty roller pipe cutter manufactured by the Geist Manufacturing Co., also of Waynesboro. The machine is made in one size only, and has a range from $\frac{1}{8}$-in. to 2-in. pipe, inclusive.

The cutter is made of tool steel, properly heat-treated, and can be reground when dull. The cutter shaft bearing is provided with an adjustable cap for taking up wear.

The guide rollers are also made



GEIST ROLLER PIPE CUTTER

of tool steel and are mounted in roller bearings in a cage or slide. The cage is elevated toward the cutter by a cam which is operated jointly by a pedal and a lever, as shown in the accompanying illustration.

The rollers are adjusted for various sizes of pipe by means of the handwheel located just below them, and the pedal and lever can be adjusted to suit the convenience of the operator. The movements of pedal and lever are limited by an adjustable stop. For pipe from ⅛-in. to ⅜-in., a small cage of rollers is attached to the regular cage without removing the regular rollers.

The machine is belt-driven and all spindles and shafts are ground and run in bronze bushed bearings. All gears are enclosed.

The length gage shown at the right of the machine is adjustable for different sizes, and for lengths of pipe up to 4 ft. The gage arm is a heavy casting and the parts which come in contact with the revolving pipe are hardened.

Cleveland Horizontal Boring, Drilling and Milling Machine

The horizontal boring, drilling and milling machine, previously made by the Cleveland Machine Tool Co., is now being built and marketed by the Sommer & Adams Co. 18511 Euclid Ave., Cleveland, Ohio. Several improvements in the design and construction of the machine have recently been made.

The column has been made wider where it attaches to the base and heavier throughout. No special base is now required as the bed is of the deep box type, heavily ribbed on the inside. The outer support may be clamped securely to the bed, or removed to accommodate other work when not in use.

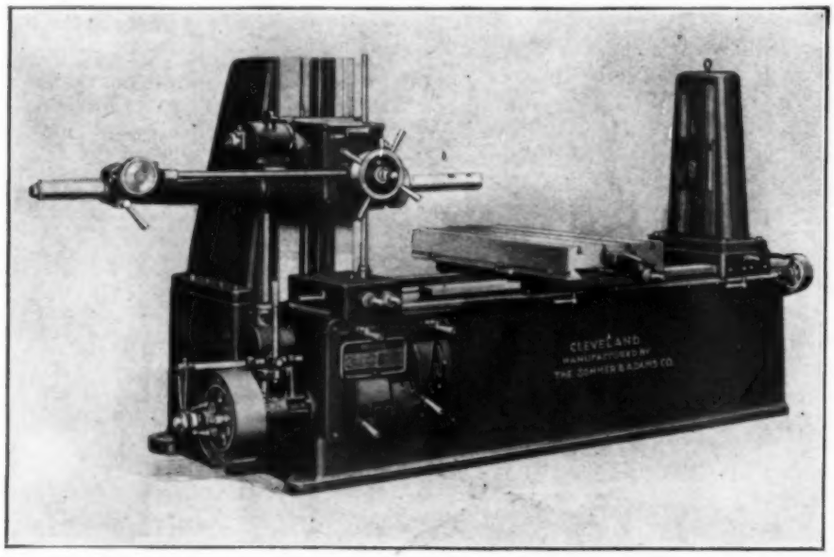
The machine is driven through a friction clutch by a single belt pulley, the recommended speed being 240 r.p.m. which will give from 10 to 150 r.p.m. at the spindle. A series of 12 spindle speeds are available through a gear box. A total of 16 feeds is provided, ranging from 0.005 in. to 0.333 in. per revolution of spindle.

The platen has a working surface 20x42 in. in size, and can be moved in either direction by a power traverse feed. Safety feed trips and a micrometer adjustment are provided for the platen.

The vertical adjustment of the spindle head is 18 in., the height from platen to spindle varying from ¾ to 19 in. The spindle is 2½ in. in diam., is fitted with a No. 5 Morse taper, and can be traversed a distance of 23 inches.

The saddle or carriage which carries the platen has a longitudinal adjustment on the bed of 36 in. All machines are equipped with a tapping attachment and vertical power feeds to head. All speeds and feeds are reversible.

For motor drive a 3- to 5-hp. motor is required, the motor being belted to the driving pulley and mounted at the rear. The weight of the machine crated for shipment is 6,000 pounds.



CLEVELAND HORIZONTAL BORING, DRILLING AND MILLING MACHINE

Britain Buys More U. S. Autos

The British imports of passenger car chassis from the United States increased to such an extent during June that the month's total of automobile imports from this country were about 60 per cent greater than in May. The total British imports of automobiles, however, declined by nearly 7 per cent during the same period.

The May total of complete passenger cars imported was 2,380; the decrease to 1,597 during June reflects the seasonal falling off in car sales which begins with early Summer, and continues usually until the Autumn buying starts. The 584 cars shipped from the United States mark the first occasion since August last year that United States shipments exceeded those from Canada. The 949 passenger car chassis imported from the United States in June is the largest number from any country during a single month, and nearly double the total of 484 from all countries during the month of May. While the number of complete trucks imported during June remained practically the same as May, the value showed a marked increase.

Automobile Trade in Costa Rica

There are about 300 cars in Costa Rica, practically all in the city of San Jose and the small cities within a radius of 15 miles, according to *Commerce Reports*, published by the Department of Commerce. Excepting possibly 10 cars of European manufacture, all passenger cars and trucks are American; importation of European cars has been discontinued. All automotive accessories imported likewise come from the United States or from Canadian plants that are branches of American manufacturers.

Only three dealers in Costa Rica carry a fairly complete line of accessories, and each of these has the agency for at least one car with exclusive sales rights throughout Costa Rica. One agent for a low-priced American car has installed a fully equipped modern vulcanizing plant. He also operates a battery charging station and carries in stock the necessary parts for the construction of new batteries; in addition, he maintains a service department for two other American cars. Two other agents have service stations, not only for the repair and maintenance of the cars for which they have the agency but for other makes as well.

Carry Full Stocks

All automobile distributors carry a complete stock of car parts and a full line of accessories, which they purchase from jobbers in the United States. The accessories and equipment carried in stock consist of: Two popular makes of American storage batteries, one of the most popular American bearings, practically all of the well-known brands of brake linings, several widely advertised American bumpers as well as the Skinner (Canadian), two American carburetors, three makes of electric horns, several jacks, lamps of all kinds, two different steering-wheel locks, five magnetos, two makes of shock absorbers, two well-known spark plugs in both inch and millimeter sizes, two types of garage jacks.

News Section

Committee to Foster Russian Trade

The formation of a Committee on Russian Trade with Henry T. Hunt, former member of the Railroad Labor Board as chairman, is announced. An effort will be made to enlist 2,000 representative American manufacturers and export houses in the resumption of trade with Russia.

"Russian conditions are rapidly approaching stability," Mr. Hunt, lawyer and a former mayor of Cincinnati, said at the Committee's headquarters, 120 Broadway, New York City. "The Soviet regime has realized that extreme and radical Bolshevism, if continued, would lead to even further economic ruin of the country. As a result, steps are being taken to protect honest business transactions and make possible trade with safety."

The committee, Mr. Hunt said, is preparing an industrial report which will exhaustively describe Russian conditions. The investigation on which the report is to be based was conducted by a group of experts, including Valerian E. Greaves, a former professor of law in the University of Petrograd, and Ellery A. Baker, formerly in charge of the Industrial Department of the National City Bank of New York.

Co-operating with the committee are representatives of export bodies and trade associations including the American Manufacturers' Foreign Credit Insurance Exchange and Lloyds of London. Monroe Curtis is aiding the work from Berlin. The committee, it is said, is studying the possibility of obtaining credit insurance on at least a portion of the shipments, and will make arrangements for financing.

Japanese Firm Wants Catalogs

A cable received by the Barnes Drill Co., Rockford, Ill., from S. Noda, president of Roku-Roku Shoten, Japan, states that the head office at Tokio was completely destroyed by the recent earthquake and that all of the catalogs of American concerns were lost. The company is anxious to have these catalogs replaced and is requesting that they be sent to the Tokio office whose street address is 30 Takanawa Minamicho, Shiba.

Drop Forgers Will Attend A.S.S.T. Convention

The executive committee of the Drop Forgers' Supply Association held a meeting recently in Philadelphia when it was decided to make a concerted effort to invite as many drop forgers as possible to attend the convention and exposition of the American Society for Steel Treating to be held at Pittsburgh, Oct. 8 to 12.

Inasmuch as the drop forge industry is so closely allied to the aims and purposes of the A.S.S.T., all of the members by attending will be able to obtain great benefit from the many papers that are to be presented on that subject and also by visiting the exhibitors from whom they secure their materials, supplies and machinery.

Work by Committee on Marine Standards

Preliminary steps have been taken by the American Marine Standards Committee to form subject committees to study and develop standards for certain hull and engineering details and certain phases of operation practice. These subject committees are formed by the technical committees appointed and their work is to be carried on independently, but the results thereof are subject to review by their respective technical committees. When the work on any subject has been carried to conclusion by a subject committee the results are to be reported to its technical committee and upon review thereof by the latter, report is made to the executive board to have the results passed upon and the appropriate status given thereto either as "Suggested American Marine Practice" or "Tentative American Marine Standard" or "American Marine Standard" as provided by the constitution and rules of the organization. Before, however, such action is taken all concerned in the marine field are to be given opportunity to criticize or approve the results or to make recommendations for their betterment.

Government Furnishes Auto Data

Investigation of motor vehicle preferences and requirements in various foreign markets has been made by the Automotive Division of the Department of Commerce upon the request of automotive manufacturers. Reports on this subject besides covering requirements such as right- and left-hand drive, the kind of electrical equipment used, usually contain detailed list of prices of the predominant makes of cars and trucks. Full details may be obtained from the automotive division or the district and co-operative offices of the Department of Commerce.

Far East Needs American Trade Catalogs

Machinery manufacturers will render a service to their Japanese representatives by sending immediately their catalogs and price lists of recent date. Tokio and Yokohama offices were either totally destroyed or thrown into such confusion that a replacement of trade literature is in many cases a necessity before normal business may be resumed.

Machinery Exports in August

Exports of metal-working machinery during August, 1922, with revised comparative figures for August, 1923, as compiled from the returns to the Department of Commerce, were as follows:

	AUGUST 1922 Value	AUGUST 1923 Value
Lathes	52,963	99,913
Boring and drilling machines	31,370	46,283
Planers, shapers and slotters	11,980	32,891
Bending and power presses	16,061	27,704
Gear cutters	15,290	22,131
Milling machines	27,631	48,481
Thread cutting and screw machines	13,530	114,557
Punching and shearing machines	6,735	23,443
Chucks, centering, lathe, drill and other	23,566	26,090
Reamers, cutters, drills and other parts for machine tools	100,295	196,214
Pneumatic portable tools	44,772	410,070
Foundry and molding mach'y.	70,228	34,062
Other metal-working machinery and parts of	527,438	481,850
Total metal-working mach'y.	1,032,483	1,730,739
Automobiles and chassis (total)	5,137,894	7,101,654
Motor trucks and buses (except electric)	844,139	1,120,005
Passenger cars, except electric	4,286,299	5,954,814

Metal Hull Airplanes Prove Successful

A new commercial flying boat with a metal hull is completing successful trial flights at the plant of the Aeromarine Plane & Motor Co., Keyport, N. J., where it was designed and built as the first practical over-water commercial aircraft in the United States. Paul G. Zimmermann, chief engineer of the company, under whose direct supervision the machine was designed and constructed, is authority for the statement that the all-metal hull marks the same progress in aeronautics as in the case of the railroads when steel cars supplanted those of wooden construction. He added that all flying craft of the future will be made of metal because it is not so vulnerable to weather conditions and furthermore, metal craft can be produced in quantities far more economically than the old style wood and wire designs.

Chicago Machinery Men Help Japan

In the recent drive to help Japan the machinery division of the trade organizations of Chicago exceeded its quota of $22,500 by nearly $8,000. Edward P. Welles, president of Charles H. Besly & Co., was chairman of the division and F. A. Wetmore was general chairman of the trade organization group, the world war organization being revived for the time being. Thirty-seven trade divisions participated. Although the total quota was placed at only a half million dollars, the trade divisions together totaled more than $600,000.

Detroit Business Increases as Auto Production Booms

One of the most sensational price wars and production races ever experienced in the automotive field is having more than passing effect upon the machine tool industry in Detroit and vicinity.

Automobiles are being turned out by the thousands, with every manufacturer attempting to get his new models in ahead. Production figures have leaped, having surpassed 40,000 for a week in the largest plant and having jumped to more than 1,000 daily in others.

Leaders in the machine tool field report a general pick-up in business due to the normal and expected speeding up of all industrial activities in Michigan.

Announcements of new models are tumbling over themselves, it appears. During the past week two companies announced new models. One of the largest companies in Detroit is about to announce a new six cylinder car to supercede its line of fours, it is understood. Another factory is changing models.

At present the lighter cars are finding an extremely good market, which has caused observers in the automotive field to predict overproduction of some types of cars within the near future. With the approach of colder weather manufacturers are turning out a larger proportion of closed cars.

That the city has reached a stability in its industrial life is indicated by the announcement of employment figures by the Employers' Association. This shows 215,973 employees as against 215,830 of the previous week, an increase of 143, which offsets a slight decrease of 57 of two weeks ago.

Public utilities and railroads throughout the state are going rapidly forward with extensions and improvements. The D. T. & I. has purchased a new right of way in Monroe county, while the Michigan Electric Railway has recently taken over the Michigan United Railway property and has been given authorization for about $17,000,000 in bonds.

The Michigan State Telephone Co., which has already made one of its large Detroit exchanges automatic, will spend $2,500,000 additional in the city.

Export balances, bank clearances and postal receipts give a most encouraging index to the city's prosperity along every line.

South Has Further Improvement

The volume of sales by the machine tool jobbers in the Atlanta territory during the last two weeks of September continued to maintain the increase noted the first half of the month as compared with August sales, with the result that the month as a whole is generally estimated by the trade approximately from 12 to 15 per cent better than the previous month, with the outlook for the remaining three months of the year giving every promise that sales volume will continue to hold up about on this average basis.

The trade dislikes to present any definite figures as to the September volume this year as compared with September, 1922, but virtually all of the distributors agree that sales were materially better this September than last, with the average increase probably running very close to 18 or 20 per cent.

As was the case during the first half of last month, the principal sales the last half of the month were to the woodworking industries and the smaller machine shops, with the larger plants doing but comparatively little buying. In the larger tools the principal activity has been in lathes, drill presses, etc., though there has also been a good demand for smaller tools and machinery. Inquiries received by the trade the latter half of September were not larger than the first part of the month, but a larger proportion of such inquiries continued to produce business than was the case a month or so ago.

At the various Southern markets, cotton has continued to climb in price until the spot quotations have now reached 30 cents per pound, which means that the total Southern crop has increased in value in the past month approximately $200,000,000. This has given rise to a much better feeling on all sides, and machine tool distributors believe that if the present crop is marketed at these prices the result will be an indefinite period of prosperity for all industry in the South. For that reason the jobbers are looking for tool sales the last three months of this year to hold up to a level of about 15 per cent greater than the volume during the Summer months, and probably from 18 to 20 per cent greater than the total volume the last three months of 1922.

Business Steady in Chicago

Industrial buying in Chicago continues slow. The Sinclair Oil Co. has made some purchases. Single tools are bought now and then by industrials.

The Chicago, Indianapolis & Louisville Ry. has entered the market for one double-cylinder planer to handle 12-in. material; one combination automatic car gainer; one vertical and horizontal chisel mortiser with vertical car borer attached, having carriage 40 ft. long; one cut-off saw to cut material 10 in. square; one rip-saw to handle material 8 in. thick by 16 in. wide, and one No. 3 hand saw. The Pennsylvania R.R. is said to have purchased a 90-in. wheel quartering machine. The Seaboard Air Line has purchased two 100-ton bushing machines. The Chicago, Milwaukee & St. Paul Ry. has made some purchases and the Pullman Co. is making inquiry for several tools.

The dealers in second-hand machinery continue to get a fair volume of business. Since industrials continue production in good volume, dealers believe that they will buy machine tools in the next few weeks.

While present buying of steel is small, indications are that tonnages of importance will be placed in the near future. Mills are not exactly in need of tonnage, but shipments have been going forward for some time in excess of new orders and backlogs are unquestionably being reduced.

Better news was heard on the Chicago market this week. It was learned that railroads are inquiring for more cars, and there has been a further improvement in the farm implement industry, some implement manufacturers operating at as high as 85 per cent of capacity. Forge companies are unusually active, and building is going ahead in Chicago at a high rate considering the season of the year. Tank companies which have been practically out of the market for some time are again inquiring for steel. About 14,000 tons are involved in tank projects awarded the last few days.

Consumption of steel continues about the same, shipments exceeding new orders. Pressure for deliveries is still almost as heavy as during the Summer months. All classes of consumers are reported willing to take steel if shipments could be obtained in from three to six months.

Good Reports from Connecticut

The sales and production pulse throughout the Connecticut district is normal and a healthful condition for ensuing months is anticipated. None of the manufacturers interviewed are manufacturing for stock, preferring to begin at this time to anticipate the Jan. 1 inventory. Although this is the condition everyone is planning production schedules based on trade inquiries.

A production superintendent in one of the principal chuck manufacturing concerns of this district made a study of his production records a day or two ago and has drawn conclusions and inferences which he anticipates will obtain and is going ahead on the indications revealed. Production figures for 1920, 1921, and 1922 were paralleled. The three lines show an upward trend from January to July, when they decline slightly and in August and September the curve swings upward with October and November holding quite a general high level but a slight fall in December is indicated. Based on the three years' indication he has worked out a schedule accordingly, at the same time anticipating the probability of the necessity of meeting a better trade condition. The salesmanager of that organization made a two weeks' trip among the automobile industries of Michigan and returned with the encouraging information that a higher peak in sales can be expected. The automobile salesmanagers and production superintendents in Michigan hold out bright prospects and this industry reflecting most noticeably in the chuck business the prospects are even better than "favorable." He found the automobile trade busy. Railroads are also buying and they are noticeably strong with the inquiries.

In the chuck manufacturing districts replies to queries revealed that in every instance the production organizations are larger now than in pre-war times and in two instances the working or-

ganizations were reported to be as large or larger than at the peak of production during the war. Immediately after the war, one manufacturer explained, his war working force was maintained and stock production was carried along and a very considerable inventory was piled up—the product being as staple as nails, and while his organization is not now so large the sales represent 100 per cent more than production.

A manufacturer of big machines reports production schedules for the next month, anticipates healthful trade and does not reckon any let up. The inquiries are of such volume that the manufacture must go along on the present satisfactory basis to meet even fifty per cent of the normal sales following inquiries.

New York Ready for Fall Trade

Makers of automobile accessories and parts for automobiles are the purchasers of machine tools at this time of the year in the New York City district, according to the dealers. September has proved to be a good month in some respects, while in actual sales made it has not been up to expectations. Machine tool dealers are by no means pessimistic, however, and are of the opinion that the Fall business which is just starting will be as good as has been anticipated.

Railroads are buying occasionally but not to the extent that they were during the first part of the month. Inquiries from these sources are larger than usual and continue to show every sign of a renewed activity in the buying within a short time. Heavy machinery has been asked for in several instances and orders that total large amounts are confidently looked for by Metropolitan dealers.

Automobile production was better during the month of September than it has been since June and inquiries from this field have been received in abundance. Buying has also resulted in some cases.

General industrials are not expanding and no plans are to be found of contemplated expansion within the next month. Woodworking machinery received some attention during the latter part of the month.

Used machinery is in better demand than usual. Some railroads are buying re-built and used machine tools, it is reported.

Exporting is a trifle better than it has been in several weeks. The conditions in Europe seem to be clearing and exporters hold out hopes for a greater renewal of activity as soon as the Ruhr complication is straightened out.

Will Discuss Wire Gage

There will be a public hearing on the subject of wire and sheet metal gages on Oct. 8 at 10 a.m. in Room 1101, Engineering Societies Building, 29 W. 39th St., New York City. The meeting is being arranged to give opportunity for discussing the wire gage series proposed by a subcommittee of the National Screw Thread Commission and discussed briefly in the *American Machinist*, Vol. 58, No. 7.

Good Business in Indiana Reflected in Machine Tool Trade

While there seems to be a good deal of uncertainty in Indianapolis concerning what will happen industrially this Winter, this doubt, apparently, has affected the machinery business very little. There is some hesitancy, it is true, on the part of some to make new installations, but for the most part the situation is good. Prices seem stabilized, brokers here say, and this is having much to do with buying. They point to the fact that most executives realize that now they will be able to get both machine tools and machinery about as cheaply as they will for some months, or even years.

With the construction program on the wane, the interior finish sash and door and flooring mills, which until this time have been crowded with work, are finding time not only to make repairs and replacements, but to make some installations as well. There has been some steady buying from these sources during most of the Summer, but many factories were entirely too busy to think of any plant additions at that time. The increase in business coming to the furniture factories of the state is causing some expansion in production and dealers and manufacturers here report several inquiries for special machinery for these plants.

The automobile business is beginning to cause some surprise. Especially is the tool business good. Most plants here, instead of getting out their Fall jobs under pressure and then cutting production, not only have got out their usual Fall work on time, but are finding the demand from dealers continuing. Auto accessory manufacturers here, of which there are many, including shock absorber factories, body factories, and specialty factories, are profiting by this increased business and also are buying both machinery and tools.

Money is easier and bankers here say there is no cause for any legitimate industry worrying because of the supply or rate.

Inquiries Plentiful in Cincinnati

The machine tool industry in Cincinnati is in the midst of a lull which has affected the sales of practically every one of the houses. Buyers who have been placing orders are showing more caution in making purchases while the automotive industries are buying only what is absolutely necessary. Railroads have been less active than at any time in the past few months in ordering equipment.

Several executives attribute the decrease in sales to the fact that there is a great deal of used machinery on the market and also to the fact that there has been considerable machinery bought up by concerns at forced bankruptcy sales.

Many Inquiries

Despite the fact that orders have fallen off to a great extent, inquiries are plentiful and it is hoped that many of these will materialize into orders within the course of the next few weeks. Lathes have been selling in fair numbers, but production at best can only be said to be fair. Planers also are having rather slow sales with inquiries numerous. Electric drills and grinders have decreased in demand and the market for them is somewhat dull. Conveying machinery is probably in better demand in the local market than any other machinery and sales are good with prospects favorable for a continuation of satisfactory business in the immediate future. Milling machines have been selling only fair and production in this line has fallen off to some extent.

The improvement in the employment situation in Cincinnati has been of assistance to machine tool plants. A survey shows that there is a slight surplus of skilled workmen, while there are also sufficient unskilled workers on hand to supply all current needs in the machine shops.

The iron market is rather featureless even though there has been a slight improvement. Little interest is being manifested in future requirements and orders placed are for comparatively small lots and prompt delivery.

Railroads Carrying Out Program

The railroads of the United States have made good their promise to provide adequate transportation for 1923, according to reports made to the Board of Directors of the American Railway Association at their first meeting since June held recently in New York. Twenty railroad executives from all parts of the country were present for the consideration of traffic conditions throughout the United States.

"The reports from the country, as a whole," said the statement issued by the Board of Directors following the meeting, "indicate that the program is being carried out to the entire satisfaction of the public.

"The program whereby the locomotives awaiting repairs was to be reduced to 15 per cent by Oct. 1, has been more than fully met. It is now below that figure, having reached 14.7 per cent on Sept. 1, thirty days ahead of the time set.

"One of the great problems every Fall has been the movement of coal via the lakes to the Northwest. The largest number of tons of coal has been dumped from Jan. 1 up to date of any year of record, insuring the full program for lake coal movement being met without any difficulty.

"The car distribution has taken place in accord with the program, and there is generally an adequate car supply in all parts of the country, and particularly in the agricultural sections of the West, where there are still a number of box cars stored awaiting grain movement."

Hardware Convention at Atlantic City

At the annual convention of the American Hardware Manufacturers' Association, to be held Oct. 16, 17, 18 and 19 at Atlantic City, N. J., group meetings will be featured with the transportation group and the mill supplies group on Oct. 18. Many speakers will be heard at both meetings with J. E. Stone of the Stanley Works, New Britain, Conn., in charge of the transportation meeting, and J. Harvey Williams, of J. H. Williams & Co., Brooklyn, in charge of the mill supplies meeting.

Business Items

The Cleveland horizontal boring, drilling and milling machine, formerly manufactured by the Cleveland Machine Tool Co., Cleveland, Ohio, is now being made by the newly formed Sommer & Adams Co., Cleveland, Ohio.

The new plant of the Sullivan Machinery Co., Michigan City, Ind., was opened with ceremony on Aug. 11, being attended by many of the officials from the Chicago plant and prominent citizens in that part of the country.

The plant and offices of J. H. Williams & Co., Brooklyn, will be moved to Buffalo. A warehouse will be maintained in Brooklyn.

Machinery for the manufacture of automobile cushions is being installed by the National Spring & Wire Co. at its new plant in Albion, Mich. The new factory will be opened soon.

The Atwood Machine Co., Willimantic, Conn., has taken over all interests of the Willimantic Machine Co., formerly of Willimantic, Conn.

The Poole Engineering & Machinery Co., Baltimore, Md., has purchased the plant of the Maryland Metal Products Co., Hagerstown, Md. The property was sold at auction. The Poole company used the plant during the war.

Tangible assets of the Anderson, Ind., Foundry & Machine Works, which includes the value of grounds, buildings, machinery, material on hand and book accounts that are believed collectable, is $616,205.59, according to the inventory that has been filed in the circuit court by W. T. Durbin, receiver.

The Millholland Sales & Engineering Co., 540 Consolidated Building, Indianapolis, Ind., has been appointed exclusive distributors in Indiana of the products of the Rockford Milling Machine Co., Rockford, Ill.

The entire plant of the United States & Cuban Allied Works Engineering Corp., and the machinery equipment of the Tindall-Morris Co., Eddystone, Pa., will be liquidated through the Industrial Plants Corp., 25 Church St., New York City.

The Brown Hoist Co. of Cleveland, Ohio, has bought the plant of the Elyria Machine Co., Elyria, Ohio, making the second Elyria plant the Cleveland company has taken over, the other being the Duplex Foundry Co.

The Phillips Custom Body Co. headed by Frank W. Phillips of Cleveland and capitalized at $375,000 has purchased the Trumbull Mazda Lamp Co., Warren, Ohio, and is preparing the building for the manufacture of high-grade closed car bodies. It will employ when running at capacity between 350 and 400 men.

The plant of the Union Iron Works at Union, S. C., destroyed the latter part of September by fire at a loss estimated at $20,000, will be entirely rebuilt this Fall, it has been announced by J. M. Morse, head of the company.

Obituary

MERRIT A. POTTER, aged 68 years, last survivor of the original incorporators of E. C. Atkins & Co., died at the Methodist hospital, Indianapolis, Sept. 25, after a long illness. He had been identified prominently with the business and civic life of Indianapolis for forty years. Mr. Potter was born Aug. 1, 1855, at Clarkston, Mich. He was the son of the Rev. Aaron Potter, a Baptist minister, and Frances Augusta Potter. He attended the University of Illinois, coming to Indianapolis in 1874. In 1878 he became associated with E. C. Atkins & Co. For two years following his connection with the Atkins company he acted as manager of the Hecla Consolidated Mining Co. of Montana, of which Mr. Atkins was superintendent and one of the large stockholders.

When E. C. Atkins & Co. was incorporated, in 1885, he became treasurer and one of the incorporators. He served in that capacity until 1911, when he became secretary.

PHILIP WEISS, manager of the Philadelphia office of the Ingersoll-Rand Co., New York, died recently in Dayton, Ohio. He was 68 years of age.

ANTOINE JEAN LANGELIER, president, general manager and treasurer of the Langelier Manufacturing Co., Arlington, R. I., died suddenly recently in New York City where he was visiting on business. Mr. Langelier was a native of Canada, coming to the United States with his parents when he was still a youth. He followed the trade of a machinist and was for several years employed by the Brown & Sharpe Manufacturing Co., Providence, R. I. With his father he established the Langelier Manufacturing Co. in Providence. Later when the company was incorporated in 1917 it was moved to Arlington, R. I. Mr. Langelier was an inventor of a great many special machines.

SIMEON L. GUEST, for many years superintendent of the Joseph Dick Foundry Co., Canton, Ohio, died recently at his home in that city. He was one of the best known foundrymen in the state and came to Canton in 1869.

GORDON BATTELE, aged 40 years, widely known in the iron and steel industry, died recently in a hospital in Columbus, Ohio. He was a director in the American Rolling Mill Co. and the Inland Steel Co. of Chicago. He was also president and treasurer of the International Steel Products Co. and the International Derrick & Equipment Co. of Columbus and a director of the Republic Fuming & Refining Co. and the Ohio Mining Co.

CHARLES R. TRANSUE, aged 53 years, superintendent of the Transue & Williams Corp., Alliance, Ohio, died at his home in that city this week. He had been superintendent of the organization since its inception.

Salmon W. Putnam—Erratum

In the obituary of Salmon W. Putnam, published on page 198f, Vol. 59, of the *American Machinist*, it was erroneously stated that he was the founder of the Putnam Machine Works, Fitchburg, Mass.

Mr. Putnam was the son of one of the founders of the Putnam Machine Works, and was one of the founders of S. W. Putnam's Sons.

Personals

ROBERT D. BLACK, branch manager for the Black & Decker Manufacturing Co., Baltimore, in its Philadelphia territory, will return to headquarters about the middle of November to assume his new duties as advertising manager for the company. Mr. Black succeeds G. W. BROGAN as advertising manager on Jan. 1.

BLAKE D. HAY has been appointed district manager for the Chicago district of the Williams Tool Corp., Erie, Pa. He succeeds HUGO E. L. MEY who has resigned.

MILTON C. FIDGEON has been appointed Eastern machinery sales manager for Joseph T. Ryerson & Son, Inc., Chicago. His offices will be at 30 Church St., New York City.

G. W. BROGAN has resigned as advertising manager of the Black & Decker Manufacturing Co., Baltimore, to enter the advertising agency business as G. W. Brogan, Inc. He will handle the accounts of the Black & Decker Manufacturing Co., the Manley Manufacturing Co., and the Dieffenbach-Westendorf Manufacturing Co.

L. W. PETTINGILL, electrical engineer, and for the past five years connected with the Cincinnati Screw Co., Loveland, Ohio, has been named vice-president and general manager of the Cincinnati, Milford & Blanchester Traction Co.

GEORGE W. TYROL has joined the sales force of the Bonney Forge & Tool Works, Allentown, Pa. He will have the territory of Pennsylvania, southern New York, New Jersey and Delaware.

CHARLES DAY, representing Mirrlees Bickerton & Day, Ltd., London, is in the United States on a business trip.

W. S. CHASE is the Pacific Coast manager for the National Acme Co., Cleveland, Ohio.

W. D. THORNBURGH, of Atlanta, Ga., for the past five years Southern representative of the Pennsylvania Rubber Co., has been appointed Southern representative of the Russell Manufacturing Co., of Middletown, Conn., manufacturer of a number of automotive accessories. Headquarters will be in Atlanta where the Russell company maintains Southern offices and warehouses at 493 Whitehall St.

E. HOWARD REED is now with the Reed Small Tool Works, Worcester, Mass.

E. L. BEISEL will represent Charles H. Besly & Co., Chicago, in New York and Pennsylvania. His headquarters will be in Buffalo.

T. C. CORNELL has joined the Cleveland office of the Black & Decker Manufacturing Co., Baltimore.

W. E. SYKES, formerly of the Power Plant Co., London, Eng., will join the Farrel Foundry & Machine Co., Inc., Buffalo, N. Y., as consulting engineer. Mr. Sykes spent last Winter in this country.

HENRY FOX succeeds E. D. ALLMENDINGER as salesman in the Detroit territory of the Black & Decker Manufacturing Co., Baltimore.

JAMES F. LYONS is now representing the Brown & Sharpe Manufacturing Co., Providence, R. I., in Los Angeles, Calif.

E. D. ALLMENDINGER, formerly in the Detroit district for the Black & Decker Manufacturing Co., Baltimore, has returned to headquarters where he will have charge of the export department that is now being formed.

MARTIN KREMER is now the consulting engineer with the Buffalo Foundry & Machine Co., Chicago, Ill.

S. T. NELSON, associated with the Sullivan Machinery Co. at the Chicago office, has been transferred to the Michigan City, Ind., plant.

H. G. SMITH, at present resident salesman for the Pittsburgh and western Pennsylvania territory of the Black & Decker Manufacturing Co., Baltimore, will succeed ROBERT D. BLACK as branch manager in charge of the Philadelphia territory, which includes all of Pennsylvania, Delaware and the state of New Jersey, south of Trenton.

HERBERT C. POOLE was appointed works manager of the Colonial Steel Co., Pittsburgh. Mr. Poole has been in charge of the New York office of the company for the past thirteen years.

M. A. WEIDMAYER, formerly in the Philadelphia and eastern Pennsylvania office of the Black & Decker Manufacturing Co., Baltimore, will have charge of the industrial department with headquarters in the New York City office of the company.

CHARLES M. BROWN was elected president of the Colonial Steel Co., Pittsburgh, Pa., succeeding D. W. DUN LEVY.

JACK BRADY, who has been connected with the W. A. Jones Foundry & Machine Co., Chicago, for over 40 years, and for the last 30 years foreman of the foundry, retired from active service during the past month.

HAROLD P. CHILDS, formerly special representative of the executive offices of the General Electric Co., New York, has become associated with the Heine Boiler Co., St. Louis, as manager of the New York offices.

R. E. MIZENER, formerly connected with the Cleveland office of the Black & Decker Manufacturing Co., Baltimore, will be connected with the industrial department with headquarters in New York City.

WILLIAM DAVIE, formerly with the Toledo Machine & Tool Co., Toledo, Ohio, has been made superintendent of the Peninsula Foundry & Machine Co., Portland, Ore.

EDWARD G. SMITH, for the past six years sales representative in the central states for the Matthew Addy Co., Cincinnati, will become manager of pig iron sales of the Belmot Iron Works, Irontown, Ohio, Oct. 1. He formerly was manager of sales and purchases of the Howe Scale Co.

NELSON LITTELL, formerly second assistant examiner in the United States patent office, has resigned and will engage in the practice of patent law. in Washington. Mr. Littell examined patents of metal working machinery while with the government.

E. F. SMECKEL is in charge of engineering for the American Steam Truck Co., Elgin, Ill.

W. H. KILPATRICK, formerly with the Buick and Willys-Overland organizations, and a specialist in electrical equipment and power installation, has been made factory manager of the Chalmers plant.

ELLIOTT B. FIELD, formerly of Detroit, has been appointed advertising and publicity manager for the Kissel Motor Car Co., Hartford, Wis., according to a recent announcement of the company.

H. E. BRIDGWATER is now the production engineer for the Smith Premier Works of the Remington Typewriter Co., Syracuse, N. Y.

J. E. BACHELDER has been transferred to the St. Louis office as representative for Fairbanks, Morse & Co., Chicago.

JACOB TRAUTMAN, JR., has been appointed assistant sales manager of the Colonial Steel Co., Pittsburgh, Pa.

Fine Exhibits at Buffalo Meeting of Steel Electrical Engineers

Buffalo was the scene of the annual gathering of the Association of Iron and Steel Electrical Engineers, who met on Monday to Friday, Sept. 24 to 28. The most striking feature of the convention was the exhibits made by manufacturers of equipment used in this industry. Each year the association attracts in greater degree the interest of exhibitors, and a very striking feature this year was a completely electrified foundry in operation at the Broadway Auditorium, where the exhibition was staged. This was made possible by the co-operative effort of several manufacturers, and the installation included an electric furnace, molding machines, air hammers, crane, cleaning outfit, crushers, grinders, sand blast and compressors. Two heats were conducted each day and commercial castings were produced.

The technical sessions of the convention were interesting and covered a wide variety of subjects. On Monday afternoon committee reports were heard and that of the standardization committee excited a great deal of discussion.

RECOMMENDS CO-OPERATION WITH A.E.S.C.

The committee said that a big problem was encountered in getting the co-operation of the members and recommended more positive co-operation with the American Engineering Standards Committee. A resolution was passed asking the executives of each steel company to appoint one of its men, who must be a member of the association, to act as a standardization committee with authority to carry out the committee's decisions.

The chief reason for a greater degree of standardization, in the opinion of the committee, was to reduce the carrying charges incurred when there are big inventories of spare parts. Members in general agreed with the committee's recommendations.

On Tuesday morning the report of the bearings committee gave rise to an animated debate. In general the committee recommended the standardization of a few sizes of bearings and listed as tentative suggestions sizes 304, 305, 307, 309, 311, 314, 317, 320, 323, 329 and 336 for motors up to 150 hp. A committee of representatives of anti-friction-bearing manufacturers tentatively suggested the following sizes for motors of from 1-hp. to 100-hp. rating: 305, 306, 307, 308, 309, 310, 311, 312, 314, 315, 316, 317, 318, 320 and 322.

The committee stated that there was unanimous agreement as to the necessity for ball and roller bearings in the steel industry and added that ball and roller bearings should be interchangeable.

MANY GOOD PAPERS

Other good papers presented on Tuesday dealt with motor-operated centrifugal pumps, skip hoists for blast furnaces and a system of coal and ore bridge traverse control against wind and "skewage" hazards.

The electrification of a foundry was the subject of a paper by L. W. Egan on Wednesday morning. The author stated there was great need of a rational and comprehensive engineering study of foundry production and maintenance methods. He outlined the advantages and disadvantages of electric foundry equipment and accented the fact that central-station energy should be used.

F. A. Coleman said that of the four types of ovens—coke, oil, gas and electric—used in core baking, the electric offered the best possibilities. Among all these agencies electricity only was on the decrease as regards price and on the increase as regards application. He asserted that another element making for a greater use of electric core-baking ovens was the fact that the electric oven was more accurately and readily controlled and eliminated the human element to a greater extent than any other.

Mr. Shepard of the Shepard Electric Crane & Hoist Co. said foundrymen had come to no agreement as to the relative advantages of alternating current and direct current and suggested the adoption of direct current for cranes. Officers of the association for the ensuing year were elected as follows: President, R. S. Shoemaker, Middletown, Ohio; vice-president, A. C. Cummings, Pittsburgh; secretary, J. F. Kelly, Pittsburgh; treasurer, James Farrington, Steubenville, Ohio.

The Industrial Review

September brings better business in most lines and the future appears brighter than during the Summer months—Machine tools needed in many industries this Fall

THE month of September ushered in a much better outlook in all lines of industries than had been prevalent during the two previous months. In nearly every classification of manufacture, production improved and in most cases sales took on an added impetus. The Japanese disaster was viewed by many in this country as having little present influence as far as business was concerned, but undeniably the cause of orders in many lines in the future. At the present time iron and lumber are about the only two commodities that have found a market in the stricken cities of Tokio and Yokohama. Orders for other articles are expected within from three to six months from now.

September brought a certain amount of optimism to the machine tool builders of the country when comparisons were made with the Summer months that had just been passed. In the New York district purchasing by railroads was experienced and further purchasing by the General Electric Co., the Western Electric Co., the American Locomotive Co. and some of the automotive plants around the Metropolis was recorded. Some little expansion was reported in September by general industrials, but nothing of great importance.

Other cities showed improvement on a par with New York. Pittsburgh maintained a steady volume of business with slight improvement noted; Milwaukee saw a determined improvement and a final breaking away from the lethargy into which it was plunged during the heated months; Chicago reported that railroads were both buying and inquiring freely, but complained because general industrials were not better customers; Philadelphia said that woodworking machinery was in good demand during September and that most machine tools showed signs of advancement; Detroit reported increases in employment and a resumption of work at most of the automotive plants around that district; Cincinnati claimed that production was satisfactory; Indianapolis reported a larger number of inquiries that is usual and prospects for increased business good; and Buffalo had but few complaints with condition. From Canada has come the cheering news that all lines are in a better condition than a year ago.

In the Electrical Field

Electrical goods for use during the Fall, Winter and Holiday seasons are selling, according to the latest advices from that field. While buying is later than usual this year it is more spirited, it is claimed, and the season will be one of the best recorded in that industry. In the other branches of this industry good reports are received. Heavy electrical machinery such as is made by several large manufacturing companies, is in good demand and the only complaint of makers of these lines is the lack of capable skilled labor.

The sale of electric delivery trucks is progressing steadily and this branch of the business is expected to be further increased each year.

Electric Railways

With the approach of Fall, the electric railways in the North are hurrying to complete all the outside work which they now have under way. The program of construction by the companies last Fall in anticipation of the new year included in the budget items of $105,000,000 for ways and structures, $90,000,000 for equipment, and $45,000,000 for power making a total of $240,000,000. A good portion of the work thus called for has been completed, but there is still much of the inside work that is yet to be started.

Right after the railway convention in Atlantic City early this month, work will be commenced on the budget of 1924 and it is expected that the schedule will call for even greater expenditures than were budgeted for this year. On the whole the electric railways have done well this year despite unfavorable factors in the cases of a few.

So far as the steam roads using electricity on any of their divisions are concerned, they appear to be working well ahead on their program for the coming year. The Long Island R. R. has already announced that it will spend $2,863,000. The New York Central R. R. has plans for about a hundred miles of electrification work around Albany and expending over the Boston & Albany R. R. as far as Springfield.

Railways and Buses

The purchasing of buses for use in city and suburban transportation continue at a surprising rate. A significant development is the growing appreciation on the part of the electric railways that the bus has a real place in the transportation world of today and that it lends itself to easy annexation to the railway company. A survey just completed shows that in 1922 there were 56 electric railways operating 350 buses and today there are more than 90 companies operating 725 buses. The use of buses by the railways necessitates the installation of entirely new machinery. In the case of the installation of five buses in Trenton, N. J., by the Trenton & Mercer County Traction Corp., a building has been especially set aside and new tools bought for the machine work to be done in connection with the operation of these vehicles and the additional new ones it has proposed to purchase.

Comparative Prices of Shop Supplies

Average of New York, Chicago and Cleveland Prices

	Unit	Current Price	Four Weeks Ago	One Year Ago
Soft steel bars..	per lb....	$0.0337	$0 0337	$0.0285
Cold finished shafting.....	per lb....	0.0433	0.0433	0.0373
Brass rods.....	per lb....	0.165	0.1741	0.171
Solder (½ and ½)	per lb....	0.262	0.276	0.2283
Cotton waste...	per lb....	0.1225	0.1231	0.1458
Washers, cast iron (½ in.)...	per 100 lb.	4.66	4.66	4.33
Emery, disks, cloth, No. 1, 6 in. dia.....	per 100...	3.08	3.08	2.96
Lard cutting oil	per gal...	0.575	0.575	0.575
Machine oil....	per gal...	0.349	0.349	0.36
Belting, leather, medium.....	off list....	37%	37%	44½%
Machine bolts up to 1x30 in.	off list....	49½%	44¼%	50

The Chemical Market

The long chain of circumstances that causes improvement in the chemical lines has started to move and consequently improvement is at last noted in this industry. Consumers who use chemicals have been busy during the past six weeks and at this time it is reflected through several various channels in the chemical industry. Inducements for contracting for 1924 are being held out by makers of heavy chemicals.. The export business is reported as improved and further improvement is expected almost daily.

At the recent chemical show held in New York City, manufacturers of chemical machinery who exhibited stated that business was good and that the Fall season would be a busy one for them. In the expansion line, the Dupont interests are putting up a new cellaphane plant in Buffalo.

Work at the Mines

There is much construction work under way in the mines. In Arizona and in the Couer d'Alene district of Idaho improvements are being made and expansion work is going on at a good rate. At the New Cornelia's mine at Ajo, Ariz., a four million dollar flotation plant will be ready by the first of the year.

Coal Situation

The anthracite workers did not return to the mines as quickly as was anticipated. It was expected that all mines would open on Sept. 19, but most of them reported that only about half of the men returned to work and that it was doubtful if they would all be back by October. This has slightly retarded possible purchases of machinery.

Bituminous sales are not up to expectations, but production keeps up to a high level. Because of the anthracite strike scare, many manufacturers quietly bought up bituminous and stored it against their needs, hence the normal sales for this time of the year are totally lacking.

The Business Barometer

This week's outlook in Commerce, Finance, Agriculture and Industry based on current developments

By THEODORE H. PRICE
Editor, *Commerce and Finance*, New York

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WERE it not for the pall that seems to hang over the New York Stock Exchange, the week's developments would probably have inspired what was formerly called a boom. I would therefore again advise a disregard of the rather discouraging tone of the stock market.

The melancholia of the New York stock brokers was somewhat increased last week by a speech in which the president of their exchange charged that three or four politicians had attempted to blackmail his institution unless its management desisted from its pursuit of the bucketshops. The District Attorney has brought the charge to the attention of a Grand Jury and everyone is waiting to see what will happen.

As a market thus beclouded does not attract the optimistic, the bears have not encountered much opposition and it has been easy for them to depress quotations by selling the stocks that belonged to others and could be borrowed from the brokers by whom they were carried.

While this method of depreciating values is legal it has been so generally practiced of late that its ethical propriety is again being questioned and a movement to make it illegal is being considered.

It used to be supposed that the securities that were listed on the New York Stock Exchange were advantaged. Now a listing is coming to be regarded as a disadvantage, for it opens the door to the predatory short seller who seeks to depreciate values to his own profit when the public is timid or lethargic or an illusion of adversity can be created.

The depressing influence of such operations is intensified by the wide publicity given to the prices made on the New York exchange, and thus it often happens that constructive enterprise is halted and business activity chilled by the factitious operations of those who do not even own the securities they are selling.

This seems to be the case at present, for unless all of the many prominent business men who are quoted are mistaken, the prospects for a Winter of prosperity have rarely been brighter. Corn, our most valuable crop, is at 91 cents, the highest of the year and 22 cents above its value 12 months ago. Cotton, the second most valuable crop, is also at a very high price. Wheat is resilient at $1.10 for May delivery in Chicago.

Cattle, hogs, beef and pork are passing readily into consumption at figures that ought to be satisfactory to the producers. Sugar is selling at about twice the prewar normal. The dry goods trade is said to be excellent. The head of the American Woolen Co. says his business is satisfactory. In the foreign markets, wool is advancing. Silk, both natural and artificial, is eagerly bought at advancing prices.

The Baltimore & Ohio has resumed the payment of dividends on its common stock at the rate of 5 per cent. Other railroads seem likely to follow its example soon and nearly all of them report an enormous traffic with earnings to correspond. Bank clearings tell the same story. Anthracite coal is high, but the bituminous product is cheaper as is petroleum, although the production shows signs of decreasing.

> "Looking abroad the prospect seems equally reassuring. Germany has announced that she will abandon passive resistance in the Ruhr and France has answered that she will make her occupation of the district 'invisible'. On their face, these concessions seem to deal with 'imponderables' but practical men understand that they mean that both parties are tired of the struggle and are willing to get together."

The automobile production keeps up and the amount of Autumnal building planned is unusual. There is an abundance of bank credit. At 76.4 per cent the reserve ratio of the Federal Reserve System is nearly double the legal minimum, and about the only flaws in an otherwise flawless domestic situation are what is called a "waiting market" in the steel industry and a sluggish demand for copper at 13½ cents.

Looking abroad the prospect seems equally reassuring. Germany has announced that she will abandon passive resistance in the Ruhr and France has answered that she will make her occupation of the district "invisible." On their face, these concessions seem to deal with "imponderables" but practical men understand that they mean that both parties are tired of the struggle and are willing to get together. The optimists in England are meantime working to bring about the Anglo-Franco-German economic and industrial *entente* of which they have been talking so long.

Some things indicate that it is now nearer than it ever has been previously and if Secretary Mellon is quoted aright he has given it a boost by saying that a German loan could and should be floated in this country.

The Council of the Ambassadors has decided that the 50 million drachmas that Greece put up should be paid to Italy and Mussolini has surrendered Corfu. A big loan of one or two hundred million dollars to Japan is under consideration and the lumber markets on the Pacific Coast are firm in the confident expectation that a large share of the money borrowed will be spent there.

Increased activity in our trade with Mexico is reported and American capitalists are again commencing to look across the Rio Grande for speculative opportunities. Even Russia is inviting the *entrepeneur* to inspect and develop her undeveloped resources, and Brazil is becoming excited as she feels the dangerous stimulus of an inflation caused by the issue of a depreciating paper currency.

If this summary of conditions is fair and is considered in connection with the fact that everyone in this country is employed at good wages, then there is no reason why the pessimism of the New York Stock Exchange should be allowed to discolor the roseate business outlook and every reason why the merchants, manufacturers and farmers of the United States ought to be satisfied and hopeful.

The markets will continue to fluctuate, the careless and ignorant will continue to make mistakes, efforts to correct them by the enactment of special legislation will continue to be made, but in essentials the position is sound and those who conduct their business with reasonable circumspection ought to make reasonable profits and enjoy a reasonable prosperity.

From their utterances most men of affairs would seem to be in agreement with the optimism of the foregoing. There are, however, some who may challenge it in so far as the farmer is concerned. To such there is offered by way of consolation and rebuttal the following quoted from the instructions issued by Senator Capper's publishing concern to the salesmen who sell his agricultural papers to the farmers:

"I want to suggest yet once again that all salesmen for the House of Capper keep close to the favorable news which is developing. With advancing security markets which will soon become evident, better hog prices, the largest corn crop in years, and abundance of grass in pastures, huge hay crops, satisfactory dairy and poultry prices, abnormally big sales by the mail order houses, and an improved psychological attitude on the part of the people generally with respect to buying, we have some real sales arguments."

Even the members of the Farm Bloc ought to cheer up when they read this.

Westinghouse Man Tells of Japan's Earthquake

Letter to American office vividly describes horrors of recent disaster—Steel skeleton buildings withstand all tremors—Plans for Tokio and Yokohama rebuilding

WHAT terror and disaster ensued during the terrible Japanese earthquake and the scenes left in its wake are contained in a dramatic story just received from F. C. Middleton, a representative of the Westinghouse Electric International Co. in Tokio, who was in the midst of the holocaust. The men he mentions in his account are L. A. Osborne, vice president of the Westinghouse Electric & Manufacturing Co.; I. F. Baker, manager for Japan, and R. A. McManigal, another representative of the company. The Takata & Co. building mentioned is the Company's headquarters in Japan.

Part of Mr. Middleton's account of the earthquake follows:

"At two minutes to twelve o'clock noon, Sept. 1, I was in the very middle of a letter to Mr. Osborne, when a giant subterranean ice wagon seemed to drive under the building. The building lifted gently four times. I looked up at Mr. Baker and as I did so he shouted 'get out,' and the three of us, (Baker, McManigal and the writer), started for the door. Immediately following the vertical vibrations a giant hand seemed to seize the building and shake it, exactly as a terrier would shake a rat. We reached the corridor and tried to rush down the stairway from the second floor to the entrance. Plaster was falling about our ears and the tiles of the wainscoting popped out horizontally at us. Although we were only on the second floor, it must have taken fifteen seconds to get into the street, owing to the rapid vibrations and the debris under foot. We ran across the street to keep away from possible falling walls and looked about. Tokio was covered by a haze of dust and plaster. The Takata building was swaying backward and forward through an arc of at least two feet. As we watched it, the second quake came and thereafter at intervals of say, twenty minutes, other minor quakes occurred. We had all left the office without our hats or coats and the writer never returned.

More Severe than Frisco

"Although the Tokio quake was much more severe than the San Francisco quake no one realized what had happened. The three of us shook hands and congratulated ourselves on our escape and I, at once, asked Mr. Baker for permission to proceed immediately to Yokohama to ascertain what had happened to my wife. Of course, Mr. Baker realized that we all wanted to know how things were going at home, so I started off, without a hat or coat, to the Tokio station. I went up to the platform and there noted the first serious quake damage. The roofs of the steam platform and departing electric platform had both collapsed. Even then, probably two hundred passengers were expecting the next electric train to leave in a minute or so. Looking Southward from the platform the rails were all in perfect alignment and we all supposed that traffic to Yokohama would be unimpeded. This was probably ten minutes after the first quake. From the platform, I noted a large fire in the direction of the Imperial Hotel, which was, I believe, the Tokio Telephone Co. To the North, just beyond Mitsukoshi, another large fire had broken out in the fish market. After twenty minutes, I realized that there was no possibility of getting a train to Yokohama. I then went to the front of the Tokio station and looked about for a taxi. There was none.

"The Marunouchi building completed six months ago by the Fuller Construction Co. of the Orient, was still standing. Most of the facing brick had been shaken to the sidewalk. Several persons had been killed or injured by these falling pieces. Foreigners reported the inside decorations mostly destroyed. However, owing to its steel skeleton construction, it did not collapse. The Nippon Oil Co. building immediately adjoining the Marunouchi building, another steel skeleton structure, was still standing but the second floor was completely wrecked.

"Adjoining the Nippon building there had stood an eight story reinforced concrete building without a steel skeleton. This had completely collapsed. It is reported that two hundred workmen were killed. This is easily credible as the writer does not see how any living thing could possibly have escaped the tons of concrete that crushed through the basement.

Had To Walk

"Five foreigners and the writer, after endeavoring to charter or even buy a taxi, started from this point to walk to Yokohama. As we came past the Metropolitan police station, the Tokio Telephone Co. fire had gained such headway that it was seen that the police station, Imperial theater and Tokio Kaikwan were doomed. There was no water pressure. One fire engine was pumping a futile stream from the moat surrounding the palace grounds.

"As we passed from the Marunouchi (business) district, we noticed that small Japanese shops were standing, although most of their tile roofs had slid off into the street, making walking rather difficult. The writer still hatless and coatless, once thought of purchasing a cap or straw hat at one of the numerous shops, but the constantly recurring quakes kept everybody away from the buildings.

"Four stations south of Tokio, 2½ miles, we saw the first distortion of the electric line running from Tokio to Yokohama. From here on, the quake was of incredible violence. As we walked along the railroad road bed, we noted factories on either side, completely demolished. The railway semaphores were frequently overturned and prostrate across the rails.

"At Omori, the writer began to realize that Yokohama and other points south of Tokio had received a very much more severe shock. An ominous haze enveloped the horizon in the direction of Yokohama. Several factories all in flames or already burned out were passed. At Kawasaki, the General Electric plant was still intact, except for what I supposed was the main office building, composed chiefly of windows, which had simply fallen inward on itself, so that it was a total wreck. This plant was situated in the center of a large number of rice fields and was bounded on the East by the railroad. It may possibly have escaped the flames, although the smallest spark from the burning Japanese village to the East of the railroad would have started a fire which would have consumed the entire plant, as there was no one to put his foot on an incipient blaze.

"Finally after a walk of thirty-five miles we reached the Southern outskirts of Yokohama. The scene from the hill on which we stood is utterly unimaginable. What had been a city of nearly half a million that morning was now as complete a desert as the heart of the Sahara. With the exception of perhaps six Japanese who had probably taken refuge in one of the numerous canals, not a living thing was to be seen, and not one solitary building was standing. The only route we could follow was the street car line leading from past the prison northward to the city.

"Of course, there were no electric lights nor were they needed as a dense pall hung over the entire region and reflected the glow from the burning oil tanks at Konagawa.

"Yokohama Park is approximately one block and a half square. Thousands of Japanese had succeeded in reaching this little oasis, but countless more thousands never had a chance to even get started. The writer reached this park at 2 o'clock in the morning, hatless, coatless, shoeless and completely exhausted. Here, I learned that Mrs. Middleton had been seen in the park after the quake and was presumably as safe as anyone. From 2 to 4 a.m. I lay in the mud of the baseball field, too tired to think or even move or sleep.

"At 4 o'clock it became light enough to make it possible to walk about in the park. Only those who have been in Japan will realize what the park must have been. Immediately after the quake, the water mains had burst, so that the park was a sea of filthy, soupy mud, from two inches to five feet deep.

Refugees on Ship

"I crisscrossed the park in every direction calling for my wife, but was unable to locate her. Finally at eight o'clock Sunday morning, our Japanese cook and her husband saw me and told me she had just been taken aboard the steamship Empress of Australia.

"Almost immediately after reaching the Empress, I discovered my wife, barefooted, hatless and clad only in the remains of a house-dress and a raincoat.

"It seems to the writer as though it would be more probable that a new Yokohama would have to be built somewhat to the North of the present site. Tokio will be rebuilt and should be infinitely a finer city than that which was just destroyed.

"Just as there was an industrial slump in America at the outbreak of the war which was followed by a rush of large orders, so it seems to the writer that business with Japan will become very brisk in a short time, especially as regards steel, building materials and machinery."

News of Washington Activities

BY PAUL WOOTON

Pending the filing of a formal report, no official comment is available as this is written, as to the cause of, and the responsibility for, the fatal explosion in the dynamometer laboratory of the Bureau of Standards on Sept. 20. The coroner's jury pronounced the death of the victims to have been due to "an accidental explosion of a gasoline and an air mixture in the altitude chamber."

An exhaustive investigation of the accident, which resulted in the death of four, and the injury of six of the Bureau's staff, is proceeding as rapidly as possible, but no announcement will be made until the investigation is completed. It is expected, however, that the investigating committee will find that the cause of the accident was due to leakage of gas fumes into the chamber.

The dead are: Logan L. Lauer, assistant physicist; Urban J. Cook, machinist; Stephen M. Lee, mechanical engineer; J. E. Kendig, assistant electrical engineer. Among the injured Herbert K. Cummings, an associate physicist, continues in a critical condition.

Secretary Hoover referred to the dead as "martyrs to science." The damage done by the explosion can be repaired for less than $10,000, Director Burgess states. No delay will result in the testing of engines as a similar chamber is available.

The experiment in progress at the time of the explosion was on an automobile engine at atmospheric pressure. The effect of low temperatures on the working of the engine was being watched. The mixture of gasoline fumes and air in the chamber was thought to have been highly favorable for explosion when ignited by the blowing out of a gasket. Had the chamber been used for testing of airplane engines, usually conducted under vacuum, no such favorable conditions for an explosion would have existed, it was stated.

The force of the explosion may be judged from the fact that the heavily reinforced twelve-inch walls of the altitude chamber were cracked badly. As the door was the weakest spot in the room, the men watching the instruments there were at the point of greatest danger.

It is pointed out that this accident will tend to emphasize the importance of the resolution adopted by the executive board of the American Engineering Council at its meeting in Cincinnati on March 23. In that resolution, it was pointed out that the government "is paying heavily in the form of employees' compensation, as well as in loss of time and efficiency, for its failure to adopt a thorough-going safety program." Attention is called to the fact that the government falls far short of the standard set by many private employers, the more progressive states and some of the municipalities. Federal safety standards were drawn up during the war, but there is no officer having the authority to enforce such standards as appear in the ruling, the resolution states.

Urge Industries to Store Coal

"Storage of coal by consumers is the all-important balance wheel between fluctuating consumption and variable production," states a report of the Coal Commission, recently sent to the President. "It is the consumers' insurance against temporary failures of transportation, such as caused by storms. It is the only protection yet devised for the consumer against protracted general stoppage of coal mining or of railroad deliveries.

"From having a few days' coal supply on hand it has been but a step forward for the consumers to accumulate a week's or month's surplus. The more distant from the coal field the larger the surplus of coal it has become the natural thing for the consumer to pile up.

"After the experience of this country in 1917-1918, in 1920, in 1922 and finally in 1923 in the storage of bituminous coal, it seems hardly necessary to call attention to the subject. In 1918 some 63,000,000 tons of soft coal were in consumers' storage piles on armistice day, an unprecedented quantity. In 1920 the lack of storage, for which the consumers were in part responsible for having so generously burned up their surplus coal in 1919, cost the buyers of soft coal millions of dollars when they precipitately sought to refill their bins during the Summer of that year.

"In anticipation of the general strike of soft coal miners on April 1, 1922, the country bought and stored more than 60,000,000 tons of soft coal in the Fall and Winter of 1921-22. This huge stock pile, largely depleted during the 5 months' strike, has been nearly rebuilt in the past Spring and Summer. More than 50,000,000 tons were on hand on Sept. 1, 1923.

"Regular, systematic, large-scale storage of bituminous coal by consumers during the seasons of low consumption is the public's largest opportunity and responsibility in solving the coal problem. Another direction in which the buyer can and should help not only himself but the coal business, is in proper selection of his fuel. The direct bearing of consumers' storage in regularity of mine operation, the reduction of over-development and the lengthening of the mine workers' year are discussed in other chapters of this report. The Commission seeks here to emphasize what it means to the consumers, that is, the public.

"The Commission made a systematic field investigation among industrials, railroads and public utilities of methods and costs of storage of soft coal. In this study, which was conducted by R. H. Kudlich, mechanical engineer of the Bureau of Mines under the direction of F. R. Wadleigh, Federal Fuel Distributor, particular attention was given to the policy of these buyers toward accumulation of reserve coal. It was found that in general the larger railroads and the public utilities have a definite policy on storage. It is, briefly, that small reserves must always be maintained and that unusual reserves are only to be accumulated against impending stoppages in supply. In areas as remote from the mines as New England and the Northwest what might elsewhere be considered a large reserve becomes inadequate insurance against interrupted supply, and the reserves in these distant markets are nearly always the largest in the country both in tons and in terms of days' supply."

Vocational Training by Cleveland Y. M. C. A.

Improvements to the combined automobile school, machine shop and gas and electric welding instruction division of the Central Y. M. C. A., Cleveland, Ohio, have been completed, and the work of turning out capable and practical men from the student body may now go forward as originally planned.

These schools have been established in a new building, ideally laid out for the purpose and particularly satisfactory for its reduction in operating expenses. The schools now have a capacity for training 215 students at one time, according to J. C. Nichols, director of the department, and can now turn out yearly between 900 and 1,000 qualified men.

Export Opportunities

The Bureau of Foreign and Domestic Commerce, Department of Commerce, Washington, D. C., has inquiries for the agencies of machinery and machine tools. Any information desired regarding these opportunities can be secured from the above address by referring to the number following each item.

Automobile and motorcycle accessories. Bulawayo, South Africa. Exclusive agency. Reference No. 7776.

Automobile accessories and parts. Santiago, Chile. Agency. Reference No. 7788.

Low priced automobile parts and accessories. Bombay, India. Purchase. Reference No. 7791.

Twist drills, taps and dies, and threading tools. Malmo, Sweden. Purchase. Reference No. 7787.

Forthcoming Meetings

National Safety Council. Twelfth annual congress at Buffalo, N. Y., Oct. 1 to 5. All meetings will be held at the Statler Hotel. Headquarters, 168 No. Michigan Ave., Chicago, Ill.

American Society for Steel Treating. Annual convention at Pittsburgh in connection with the International Steel Exposition, Oct. 8, 9, 10, 11 and 12. W. H. Eisenman, 4600 Prospect Ave., Cleveland, Ohio, national secretary.

Society of Automotive Engineers. Production meeting at Cleveland, Ohio, Oct. 25 and 26. Headquarters, 29 West 39th St., New York City.

American Gear Manufacturers Association. Fall meeting. Mountain House, Lake Mohonk, N. Y. Oct. 25, 26 and 27. T. W. Owen, secretary, 2,443 Prospect Ave., Cleveland, Ohio.

American Management Association. October 29, 30, and 31, Hotel Astor, New York City.

National Exposition of Power and Mechanical Engineering. Second annual exposition to be held at the Grand Central Palace, New York City, Dec. 3 to 8. Headquarters, Grand Central Palace, New York City.

The Weekly Price Guide

RISE AND FALL OF THE MARKET

Iron and Steel—Iron market weak, with prices tending downward. Iron still being piled up, despite high production costs due to increased cost of labor. Quotations under $23 per ton for No. 2 foundry iron have been made at Birmingham. New buying of plates and structurals extremely quiet. Numerous small orders received for new plate tonnages. Bulk of plate tonnage for car and tank construction. New structural business firm at $2.50 base, but mostly confined to small tonnages. Plates quoted as low as $2.40 per 100 lb., Pittsburgh, with very small tonnages at $2.50. Bars at $2.40 base; buying more active for fourth quarter requirements.

Advances—Electrolytic copper quiet; ¼c. per lb. higher than week ago. Chinese antimony up ⅛c. per lb., due to slight scarcity in New York market. Solder and babbitt metal higher in Cleveland warehouses.

Declines—Zinc down 5c. and lead 12½c. per 100 lb. in New York market. Fabricated brass and copper products reduced from ¼c. to 1¼c. per lb. in Cleveland warehouses.

IRON AND STEEL

PIG IRON—Per gross ton—Quotations compiled by The Matthew Addy Co.:

CINCINNATI	
No. 2 Southern	$28.05
Northern Basic	25@26
Southern Ohio No. 2	26.00
NEW YORK—Tidewater Delivery	
Southern No. 2 (silicon 2.25@2.75)	31.00
BIRMINGHAM	
No. 2 Foundry	24.00
PHILADELPHIA	
Eastern Pa., No. 2x (silicon 2.25@2.75)	26.75
Virginia No. 2	30.17
Basic	26.00
Grey Forge	25.00
CHICAGO	
No. 2 Foundry local	27.00
No. 2 Foundry, Southern (silicon 2.25@2.75)	30.01
PITTSBURGH, including freight charge from Valley	
No. 2 Foundry	26.90
Basic	26.90
Bessemer	27.90

IRON MACHINERY CASTINGS—Cost in cents per lb. of 100 flywheels, 6-in. face x 24-in. dia., hub not cored, good quality gray iron, weight 275 lb.:

Detroit	6.75
Cleveland	6.75@7.40
Cincinnati	7.50
New York	5.50@7.00
Chicago	5.00@5.50

SHEETS—Quotations are in cents per pound in various cities from warehouse; also the base quotations from mill:

Blue Annealed	Pittsburgh, Large Mill Lots	New York	Cleveland	Chicago
No. 10	3.00	4.59	3.75	4.15
No. 12	3.10	4.64	3.80	4.20
No. 14	3.20	4.69	3.85	4.25
No. 16	3.40	4.79	3.95	4.35
Black				
Nos. 17 and 21	3.70	4.95	4.45	5.05
Nos. 22 and 24	3.75	5.00	4.50	5.05
Nos. 25 and 26	3.80	5.05	4.55	5.10
No. 28	3.85	5.15	4.65	5.20
Galvanized	**Pittsburgh**	**New York**	**Cleveland**	**Chicago**
Nos. 10 and 11	4.00	5.15	4.70	5.35
Nos. 12 and 14	4.10	5.25	4.80	5.45
Nos. 17 and 21	4.40	5.55	5.10	5.75
Nos. 22 and 24	4.55	5.70	5.25	5.90
No. 26	4.70	5.85	5.50	6.05
No. 28	5.00	6.15	5.80	6.35

WROUGHT PIPE (Welded)—The following mill discounts are to jobbers for carload lots on the latest Pittsburgh basing card:

Steel Inches	Black	Galv.	Iron Inches	Black	Galv.
		BUTT WELD			
1 to 3	62	50½	¾ to 1¼	30	13
		LAP WELD			
2	55	43½	2	23	7
2½ to 6	59	47½	2½ to 4	28	13
7 and 8	56	43½	4½ to 6	28	13
9 and 10	54	41½	7 to 12	26	11
11 and 12	53	40½			
		BUTT WELD, EXTRA STRONG, PLAIN ENDS			
1 to 1½	60	49½	¾	28	12
2 and 3	61	50½	1 to 1½	30	14
		LAP WELD, EXTRA STRONG, PLAIN ENDS			
2	53	42½	2	23	9
2½ to 4	57	46½	2½ to 4	29	15
4½ to 6	56	45½	4½ to 6	28	14
7 and 8	52	39½	7 and 8	21	7
9 and 10	45	32½	9 to 12	16	2
11 and 12	44	31½			

Warehouse discounts are as follows:

	New York Black	New York Galv.	Cleveland Black	Cleveland Galv.	Chicago Black	Chicago Galv.
1 to 3 in. steel butt welded	48%	34%	55½%	43½%	50%	37%
2½ to 6 in. steel lap welded	44%	30%	53½%	40½%	47%	34%

Malleable fittings: Classes B and C, banded, from New York stock sell at list plus 15%. Cast iron, standard sizes, 17½% off.

SEAMLESS STEEL TUBING—Following base discounts are on 20 gauge or .035-in., round, cold-drawn tubing, ½-in. to 1-in., O.D., weighing 0.17 lb. to 0.36 lb. per ft. Cutting charge per 100 cuts, $1.50 to $1.58:

O.D. Inches	List Price per ft.	Differential Discount	O.D. Inches	List Price per ft.	Differential Discount
½	$0.09	50%	¾	$0.16	35%
⅝	.11	45%	1	.18	31%
¾	.14	40%			

NOTE—The discounts are to be lowered by the following differentials in the case of regular .10-.20 carbon: 25,000 ft. or over, 83; 15,000 to 25,000 ft., 82; 5,000 to 15,000 ft., 81; 1,000 to 5,000 ft., 80; less than 1,000 ft., 79.

MISCELLANEOUS—Warehouse prices in cents per pound in 100-lb. lots:

	New York	Cleveland	Chicago
Open hearth spring steel (base)	4.50	6.00	4.50
Spring steel (light) (base)	7.00	6.00	6.00
Coppered Bessemer rods (base)	6.53	8.00	6.55
Hoop steel	5.19	4.66	4.55
Cold rolled strip steel	7.50	8.25	7.25
Floor plates	5.80	5.66	5.80
Cold finished shafting or screw	4.65	3.90	4.55
Cold finished flats, squares	5.15	4.40	5.05
Structural shapes (base)	3.64	3.46	3.40
Soft steel bars (base)	3.54	3.36	3.20
Soft steel bar shapes (base)	3.54	3.36	3.20
Soft steel bands (base)	4.39	3.61	3.95
Tank plates (base)	3.64	3.46	3.30
Bar iron (3.25 at mill)	3.54	3.36	3.20
Tool steel	11.00	....	....
Drill rod (from list)	55%	40@55%	50%

Electric welding wire, New York, 3/32, 8.35c.; ⅛, 7.85c.; 5/32 to ¼, 7.35c. per lb.

METALS

Current Prices in Cents Per Pound

Copper, electrolytic (up to carlots), New York			14.12½
Tin, 5-ton lots, New York			42.25
Lead (up to carlots), St. Louis	6.72½	New York	7.37½
Zinc (up to carlots) St. Louis	6.37½	New York	6.82½

Shop Materials and Supplies

METALS—Continued

	New York	Cleveland	Chicago
Aluminum, 98 to 99% ingots, 1-15 ton lots	25.20	27.00	25.50
Antimony (Chinese), ton spot	8.75	10 50	7.50
Copper sheets, base	21.75	21.50@22.50	23.00
Copper wire, base	16.00	18.75	16.25
Copper bars, base	20.25	22.00	19.50
Copper tubing, base	24.50	27.00	23.00
Brass sheets, base	18 00	22.00	18.75
Brass tubing, base	23.00	27.00	20.50
Brass rods, base	15.75	18.00	15.75
Brass wire, base	18.50	22.00	.....
Zinc sheets (casks)	10.25	10.45	.....
Solder (½ and ¼), (case lots)	29.50	29.00	20.00
Babbitt metal (83% tin)	52.00	53.50	40.00
Babbitt metal (35% tin)	25.00	17.50	17.00
Nickel (ingot and shot)	29.00	.....	35 00
Nickel (electrolytic)	32.00	.....	35.00

SPECIAL NICKEL AND ALLOYS—Price in cents per lb.

Malleable nickel sheet (base)	57.00
Hot rolled rods, Grade "A" (base)	55.00
Cold drawn rods, Grade "A" (base)	63.00
Copper nickel ingots	37.00
Hot rolled copper nickel rods (base)	45.00
Manganese nickel hot rolled rods "E"—low manganese (base)	57.00
Manganese nickel hot rolled rods "D"—high manganese (base)	60.00

Base price of monel metal in cents per lb., f.o.b. Huntington, W. Va.:

Shot	32.00	Hot rolled rods (base)	40.00
Blocks	32.00	Cold drawn rods (base)	48.00
Ingots	38.00	Hot rolled sheets (base)	42.00

OLD METALS—Dealers' purchasing prices in cents per pound:

	New York	Cleveland	Chicago
Copper, heavy, and crucible	11.75	11.75	12.00
Copper, heavy, and wire	11.25	11.25	11.25
Copper, light, and bottoms	9.50	9.25	10.25
Lead, heavy	5.75	5.50	5.75
Lead, tea	4.75	4.25	4.75
Brass, heavy, yellow	7.00	....	7.25
Brass, heavy, red	9.50	9.50	9.00
Brass, light	5.50	5.25	6 50
No. 1 yellow brass turnings	6.50	6.00	7.00
Zinc	3.75	3.00	4.00

TIN PLATES—American Charcoal—Bright—Per box.

		New York	Cleveland	Chicago
"AAA" Grade:				
IC,	20x28, 112 sheets	$25.10	$19.50	$18.50
"A" Grade:				
IC,	20x28, 112 sheets	21.40	17.00	17.00
	Coke Plates—Primes, 20x28 in.			
100-lb.,	112 sheets	14.00	12.60	14.50
	Terne Plates—Small lots, 8-lb. Coating			
IC,	14x20	8.25	6.55	7 40

MISCELLANEOUS

	New York	Cleveland	Chicago
Cotton waste, white, per lb.	$0.10@0.13	$0.15	$0.11
Cotton waste, colored, per lb.	.08@.13	.12	.08
Wiping cloths, 13¼x13½, per lb.	11.00	36.00 per M	.10
Wiping cloths, 13¼x20½, per lb.	....	52.00 per M	.13
Sal soda, per 100 lb.	1.65	2.25	2.65
Roll sulphur, per 100 lb.	3.85	3.25	3.50
Linseed oil, per gal., 5 bbl. lots.	.95	1.06	1.14
White lead, dry or in oil	100 lb. kegs.	New York,	14.00
Red lead, dry	100 lb. kegs.	New York,	14.00
Red lead, in oil	100 lb. kegs.	New York,	15.50
Fire clay, per 100 lb. bag		.65	.60
Coke, prompt furnace, Connellsville	per net ton	$4.25@4.75	
Coke, prompt foundry, Connellsville	per net ton	5.25@5.75	

SHOP SUPPLIES

Current Discounts from Standard Lists

	New York	Cleveland	Chicago
Machine Bolts:			
All sizes up to 1x30 in.	40-10%	50-10%	45-5%
1⅛ and 1¼x3 in. up to 12 in.	15%	50%	50%
With cold punched hex. nuts up to 1 in. diam. (plus std. extra of 10%)	25-10%	$3.50 net	....
With hot pressed hex. nuts up to 1x30 in. (plus std. extra of 10%)	30-10%	3.50 net	$4.00 off
Button head bolts, with hex. nuts	List net	List net	.....
Hex. head and hex. nut bolts	List net	.....	65-5%
Lag screws, coach screws	40-10%	.....	60-5%
Square and hex. head cap screws	60%	70%	70-10%
Carriage bolts, up to 1 in. x 30 in.	30-10%	45%	40-5%
Bolt ends, with hot pressed nuts	40-10%	.....	55%
Tap bolts, hex. head, list plus	35%	.....	.....
Semi-finished nuts, ⅞ and smaller	60%	.....	....
Semi-finished nuts, ⅞ and larger	55%	65-10%	80%
Case-hardened nuts	40%	.. ....	.....
Washers, cast iron, ⅜ in., per 100 lb. (net)	$6.50	$4.00	$3.50
Washers, cast iron, ⅝ in., per 100 lb. (net)	5.50	4.00	3 50
Washers, round plate, per 100 lb. Off list	1.50	4.00	3.50 net
Nuts, hot pressed, sq., per 100 lb. Off list	0.50	2.75	2.50
Nuts, hot pressed, hex., per 100 lb. Off list	0.50	2.75	2.50
Nuts, cold punched, sq., per 100 lb. Off list	0.50	2.75	2.50
Nuts, cold punched, hex., per 100 lb. Off list	0.50	2.75	2.50
Rivets:			
Rivets, 7/16 in. dia. and smaller	50-10%	50-10%	60%
Rivets, tinned	50-10%	50-10%	4½c. net
Button heads ¾-in., ⅞-in., 1x2 in. to 5 in., per 100 lb. (net)	$5.50	$3.90	$3.75
Cone heads, ditto (net)	5.60	4.00	3.85
1⅛ to 1¾-in. long, all diameters, *EXTRA* per 100 lb.	0.25	.....	0.15
⅝ in. diameter *EXTRA*	0.15	.....	0.15
½ in. diameter *EXTRA*	0.50	.....	0.50
1 in. long, and shorter *EXTRA*	0.50	.....	0.50
Longer than 5 in. *EXTRA*	0.25	.....	0.25
Less than 200 lb. *EXTRA*	0.50	.....	0.50
Countersunk heads *EXTRA*	0.35	.....	$3.70 base

	New York	Cleveland	Chicago
Lard cutting oil (50 gal. bbl.) per gal.	$0.55	$0.50	$0.67½
Machine lubricant, medium-bodied (50 gal. wooden bbl.), per gal.	0.297	0.35	0.40
Belting—Present discounts from list in fair quantities (½ doz. rolls).			
Leather—List price, 2c. per sq.in., per ply:			
Medium grade	30-10%	30-10%	30-10%
Heavy grade	20-5-2½	30%	20-5-2½%
Rubber and duck:			
First grade	50-10-5%	50-10%	40-10%
Second grade	60-5%	60-5%	60-5%
Abrasive materials—In sheets 9x11 in.,			
No. 1 grade, per ream of 480 sheets:			
Flint paper	$6.30	$5.84	$6.48
Emery paper	9.90	11.00	8.80
Emery cloth	31.12	31.12	29.48
Flint cloth, regular weight, width 3½ in., No. 1 grade, per 50 yd. roll.	4.73	4.28	4.95
Emery discs, 6 in. dia., No. 1 grade, per 100:			
Paper	1.49	1.24	1.40
Cloth	3.38	2.67	3.20

New and Enlarged Shops

Machine Tools Wanted

Ark., Texarkana — Liddell Motor Co. — lathe and drill press.

Fla., Buena Vista (Miami P. O.)—Freeman & Sons, 3644 North East 2nd Ave.—drill press and lathe for automobile repairs.

Fla., Clearwater—Ford & Fordson Dealer—lathe, drill press and grinding in machine.

Fla., Dade City—Dodge Motor Co.—drill press and lathe.

Kan., Treece—Treece Garage—lathe.

Mich., Detroit—Dept. Purchases & Supplies, 700 Marquette Bldg., G. J. Finn, Comr.—one wheel grinding machine for street railway department.

Minn., Wadena—G. M. Blair & Co.—sheet metal working machinery, including brake, bender, beader, etc.

Mo., St. Louis—Owen Baskett Motor Co., 3333 Washington Ave.—drill press and lathe.

N. Y., Buffalo—J. Gleason,—1095 Sycamore St.—sheet metal machinery and breaker shears.

N. Y., Buffalo—Income Property Corp., 573 Elmwood Ave.—equipment for garage and repair shop.

N. Y., Penn Yan—E. L. Geer—equipment and tools for proposed garage and service station.

O., Columbus—Moore Motors Co., 66 East Broad St. (manufacturer of automobile accessories), T. E. Moore, Mgr.—grinder, drill press, lathe, etc.

O., Columbus—Norris Mfg. Co., 1424 East Cherry St. (manufacturer of vending machines), G. Norris, Pres.—24 in. lathe, drill press, small grinder, etc., for new shop.

Okla., Cardin—Jefferson Highway garage, G. Lawyer, Purch. Agt.—drill press (used preferred).

S. C., Greenville—C. O. Allen & Co.—lathe and drill press for garage.

Tenn., Knoxville — Duncan Mchy. Co., Dempster Bldg., 721 North Central Ave., J. G. Duncan, Purch. Agt.—16 to 20 in. swing, by 6, 8, 10 or 12 ft. bed engine lathe for repair shop in mill; 16 to 24 in. swing drill press (used).

Tex., Huntsville—Bd. of Prison Comrs., S. J. Dean, Finance Comr., State Penitentiary—receiving bids until Oct. 22 for woodworking machinery for wagon factory, including

No. 1 bandsaw filing and setting machine, automatic.
No. 3 heavy power feed rip saw.
No. 2 heavy swing saw.
No. 8 variety sawing, shaping and boring machine.
No. 14 post boring machine.
No. 6 vertical boring machine.
No. 6 automatic double mortising and boring machine.
No. 1 lag screw boring and driving machine.
No. 3 iron bed wood turning lathe.
No. 1 automatic axle lathe.
No. 4 double spindle shaper.
No. 1 spoke facing machine.
No. 3 iron frame double belt sander.
Model M automatic spoke driver.
No. 2 wheel tenoning and cutoff machine.
No. 1 wheel rim finishing machine.
No. 4 automatic wheel boxing machine.
No. 2 automatic skein setting and fitting machine.
All machines complete with countershafts and pulleys.

Va., Portsmouth—Doronie & Co. (manufacturer of cultivators)—lathes, drill press and forges.

W. Va., Logan—Logan Cutout Switch Mfg. Co., P. O. Box 874—lathe, drill press and buffing machine for the manufacture of electric switches.

Wis., Markesan — W. Dehn—automobile repair machinery, small tools and belting for proposed $40,000 garage.

Wis., Mauston—G. J. Moriarty (machinist)—22 in. drill press, emery grinder and one large lathe.

Wis., Milwaukee—Hoyer Eng. Co., 281 Grove St.—machine tools for proposed $40,000 machine shop.

Wis., New Lisbon—F. J. Bunker—automobile repair machinery, gasoline tanks and pumps for proposed $40,000 garage.

Wis., Portage—E. Weinke—automobile repair machinery, gasoline tanks, pumps and free air equipment for proposed $40,000 garage.

Wis., Spring Valley—Pierce Auto Co., C. W. Pierce, Mgr.—automobile repair machinery, gasoline tanks and pumps for proposed $40,000 garage.

Wis., Viroqua—Bann & Fehlberg (heating and plumbing shop)—one pipe threading machine.

Ont., Hawkesbury—E. C. Lightall, McGill St.—tool grinder, etc., for garage and repair shop.

Ont., Ridgetown—E. Fysh—equipment for proposed $40,000 garage, automobile repair shop and service station.

Ont., Rockland—F. Houle—small lathe and puncher for garage.

Ont., Rockland — O. Rousson — garage equipment.

Ont., Welland—W. G. Somerville & Son, 36 Main St., North—equipment for proposed $50,000 garage, automobile, tire and battery repair shop.

Que., Bourget—P. Tasse—drill press, etc., for blacksmith shop.

Que., Buckingham — E. C. Levesque, Joseph St.—drill press, etc., for garage.

Que., Calumet—Weldon Bros.—garage and repair shop equipment.

Que., Hudson—L. Dufresne—equipment for garage and service station.

Que., Lachute — A. C. Bradford — lathe and emery stand for automobile repairs.

Que., Montreal—D. Veseau, 231 Manufacturers St.—equipment for garage and automobile repairs.

Que., Riguad—A. Mercier—emery wheel and other equipment for garage and repair shop.

Que., St. Agathe—M. Paquette—equipment for automobile repair shop.

Que., St. Anne de Bellevue—L. Lefebvre—garage equipment.

Que., St. Jerome—Campeau & Desjardins—boring machine, gasoline tank and pump for garage.

Que., St. Rose—O. Laplante—equipment for garage and repair shop.

Que., St. Scholastique—J. Fortier—drilling machine, emery wheel, etc., for garage and blacksmith shop.

Que., St. Vincent de Paul—R. Meunier & Frere—garage and repair shop equipment.

Que., Terrebonne—F. W. Moreau—drill press, emery grinders, etc., for garage.

Machinery Wanted

Ala., Anniston—Anniston Mfg. Co.—carding machinery for proposed addition to plant.

Ala., Birmingham—W. M. Smith & Co., 1st Ave. and 46th St.—crane.

Ark., Little Rock—Arkansas Power Corp., Boyle Bldg.—electric crane.

Ark., Pine Bluff—Jefferson Cotton Mills Co.—$300,000 worth of machinery for mill, 10,000 spindle and 340 loom capacity.

Calif., Azusa—Union Rock Co.—machinery for additions to plant.

Conn., Hartford—Fuller Brush Co., 547 Asylum St.—sheet metal shear to handle 24 to 36 in. material.

Ill., Chicago—Chicago, Indianapolis & Louisville R.R. Co., 608 South Dearborn St., J. H. Liebenthal, Purch. Agt.—one double cylinder planer for 12 in. material and one 40 ft. vertical and horizontal chisel mortiser.

Ill., Chicago—Foell Supply Co., 331 West 22nd Pl.—canning machinery for proposed $125,000 plant.

Ind., Bicknell—Bicknell News—linotype machine.

Ind., Mount Vernon — B. O. Hanly — Omaha folding machine.

Ia., Mason City—W. M. Temple—8 x 12 in. Chandler & Price and Pearl job printing press.

Kan., Paola—E. M. Pinneo—rock crusher.

Kan., Treece—Miners Press—paper cutter.

Kan., Treece—J. Schnitzer—blacksmith's tools, vise and tire shrinker.

Kan., Treece—Wheeling Shoe Shop, W. M. Wheeler, Purch. Agt.—electric stitcher (used).

Ky., Wallins Creek—M. H. Thompson—complete laundry machinery.

La., Washington—The city—oil storage tank.

Md., Baltimore—Archer Laundry Co., Eutaw and Franklin Sts.—complete machinery.

Md., Baltimore—Chicago Nipple Co., 4100 1st Ave.—machinery for the manufacture of pipe nipples, also pipe bending machines.

Mich., Detroit—Nizer Corp., 3980 Gibson Ave.—equipment to enlarge plant for the manufacture of automatic refrigerating cabinets.

Mich., Detroit—D. J. Osgood Co., 814 West Elizabeth St.—equipment, including rip saw for portable woodworking shop.

Mich., Parma—News—proof press for 3 or 4 column width.

Minn., Sauk Center—Service Job Shop—7 column newspaper press and Omaha newspaper folder.

Minn., Winona—Westlicher Herold—No. 5 or No. 8 linotype magazine.

Miss., Gulfport—Herald—proof press.

Mo., Birmingham—D. E. Staggs—newspaper press (used), belting, hangers and pulleys.

Mo., Dawn—B. W. Purcell—newspaper press and equipment (used).

Mo., St. Louis—J. W. Bland, 1000 Federal Reserve Bldg.—electrically driven floor surfacing machine.

Mo., Willow Springs—J. O. Brown—single drum hoist.

Neb., Beaver Crossing—Times—newspaper press.

N. Y., Buffalo—Bd. Educ., 1400 Telephone Bldg.—receiving bids until Oct. 8 for vocational and manual training equipment for various grade schools.

N. Y., Buffalo—E. Eberl, 124 Sycamore St.—equipment for light ornamental works.

N. Y., Buffalo—W. H. Fitzpatrick, 1920 Seneca St.—woodworking machinery for small mill at 128 Hensey Ave.

N. Y., Buffalo—W. Lerandosky, 1377 East Delevan Ave.—bakery equipment.

N. Y., Buffalo—MacLean Box Co., 166 Elk St.—equipment for box factory to replace fire loss.

N. Y., Buffalo—Mitchell & Frank, 1021 Main St.—equipment for proposed knitting mill on Woodlawn Ave.

N. Y., Buffalo—Morrison & Risman Co., 1437 Bailey Ave. (iron and steel scraps)—friction saw similar to Ryerson No. 3.

N. Y., Buffalo—W. H. Prentice, Inc., 669 Main St.—equipment for addition to furniture factory at 472 Franklin St.

N. Y., Geneva—J. G. Henry, Patterson Ave.— saws, carpenter tools and shop equipment, to replace that which was destroyed by fire.

N. Y., Mayville—Brace Mfg. Co., W. D. Brace, Purch. Agt.—machinery and equipment for small plant for the manufacture of pet-cock control device.

N. Y., Newark—United States Pulp Product Co., Inc. (manufacturer of pulp egg carrier)—machinery and equipment for proposed plant, to replace that which was destroyed by fire.

N. Y., New York—Patron Machine & Millwright Co., 118 Center St., E. Patron, Purch Agt. — miscellaneous woodworking machinery and one wood top saw table.

N. C., Durham—Star Bakery Co.—dough mixer.

N. C., Washington—Susman Gin Co.—machinery for the manufacture of cotton batting.

N. C., Waynesville—Rhodolite Corp., c/o S. A. Jones—mining machinery for mining rhodolite, red garnet and corundum for output of 600,000 ton per year.

O., Cleveland—Lees-Bradner Co., 6210 Carnegie Ave.—Cincinnati Bickford radial drill.

O., Columbus—Central Refractories Co., Atlas Bldg. (manufacturer of brick and clay products), C. B. Young, Pres.—brick making machinery for plant at Shawnee.

O., Columbus—Ohio Co., 391 Dennison Ave., C. H. Slaughter, Genl Mgr.—metal working machinery, also shearing and slotting equipment.

O., Dayton—Burba Service, Box 1046—8 x 12 in. Chandler & Price and 8 x 12 in. Gordon job press, both for electric power.

O., Elyria—The city, Director of Public Service—receiving bids until Oct. 10 for a small gas driven locomotive crane with ¾ yd. bucket for handling coal.

O., Mansfield—Humphrey Mfg. Co.—5 ton and 7½ ton electric traveling cranes.

O., Warren—Packard Electric Co. (manufacturer of transformers)—machinery for proposed $350,000 addition to plant.

Okla., Cardin—J. T. Henderson—Landis stitcher for shoe shop.

Pa., Pittsburgh—Carnegie Steel Co., Carnegie Bldg.—stationary crane on concrete caisson foundation, ice breakers, etc., for coke unloading dock at Mingo Junction, O.; conveyor system for loading coal on river barges at Wilson.

Pa., Pittsburgh—Hachmeister-Lind Chemical Co., Island and Leonard Sts.—machinery for the manufacture of magnesite building materials for plant at Sarnia, Ont.

Pa., Sharon—Maniscalco New Power System Co. (manufacturer of power plant equipment), P. Maniscalco, Purch. Agt.—equipment for proposed plant at Bellevue, O.

S. C., Lancaster—Harker Hardware Co.—machinery for the manufacture of horse collar pads.

S. D., Woonsocket—F. Oddy (job printer)—linotype.

Tenn., Memphis — Rhea Coal Co., 831 Rozelle St.—loading and unloading equipment.

Tex., Temple—D. H. Buchanan—air drill with tank and compressor, 6 x 6 in.; double hoist and gas engine.

Va., Danville—Smith Cutlery Co.—machinery for the manufacture of shears, trimmers, etc.

Va., Suffolk—Planters Nut & Chocolate Co.—complete machinery.

Wash., Tacoma—Port of Tacoma, Natl. Bank of Tacoma Bldg., G. M. Osgood, Ch. Engr.—90 ft. electric crane with track and equipment.

Wis., Cambria—Arlington Canning Co., c/o Cambria Canning Co.—vegetable canning machinery, belting, shafting and hangers for proposed $50,000 plant at Arlington.

Wis., Cedar Grove—Cedar Grove Shoe Mfg. Co.—shoe working machinery equipped with individual motors for proposed $42,000 factory.

Wis., Denmark—Dufleck Bros.—woodworking machinery for proposed $50,000 factory for the manufacture of cheese boxes, etc.

Wis., Elcho—C. W. Fish Lumber Co.—woodworking machinery for proposed $75,000 factory.

Wis., Grandmarsh—A. L. Peters—conveyor, chutes, etc., for lime bins, 2 car capacity.

Wis., Janesville—Wilcox Co., 859 South Main St.—equipment, including crushers, hoppers, conveyors, hoists, etc., for gravel plant.

Wis., Knellsville (Belgium P. O.)—N. J. Johnannes—pea canning machinery, conveyors, belting and shafting for proposed $40,000 canning factory at Cleveland.

Wis., Madison—Madison Medical Assn., c/o R. S. Ingersoll, Lakeside St.—laundry machinery, including dryers.

Wis., Milwaukee—Braman Coal Co., 1283 8th Ave., P. Braman, Purch. Agt.—coal hoisting and conveying machinery.

Wis., Milwaukee—Kelly Candy Co., 656 49th St., P. L. Kelly, Purch. Agt.—candy making machinery, including dippers, mixers, heaters, kettles, etc.

Wis., Milwaukee—Larsen Bros., 1201 Oakland Ave. (millwork)—large circle saw.

Wis., Milwaukee—Quality Envelope Co., c/o T. P. Luker, 714 Hadley St.—paper cutter and trimmer.

Wis., Monroe—Harvey Paper Products Co., Knight Bldg.—one trimming and one folding machine, also presses to stamp out paper cups and containers.

Wis., North Milwaukee—W. P. Schwartzburg, 43rd St. and Hammond Ave.—air compressor and gasoline pumps for proposed $40,000 garage.

Wis., Portage—Genl. Cigar Co., B. Shannon, Mgr.—conveyors for proposed $40,000 sorting plant at Prairie du Chien.

Wis., Tripoli—H. H. Stolle, R. F. D. (sawmill)—resaw, bandsaw and rip saw, all belt driven.

Wis., Wausaukee—Laun Bros. Co.—circular and bandsaws, woodworking machinery, etc., for lumber and sawmill.

N. S., Halifax—E. B. Batson Co., Lower Water St. (machinery dealer)—sawmill blowers, lathes, etc.

Ont., Buckland — P. Lawson — planing mill machinery.

Ont., Coyne—White Rock Mining Co., Ltd., W. McVittie, Purch. Agt.—sawmill equipment and small stamp mill, probably 2 stamp.

Ont., Hawkesbury—O. Menard, Vankleek Hill Rd.—dovetailer, etc., for sash and door factory.

Ont., Hawkesbury—Rochon & Fils, Main St., E.—vise, drill, emery wheel, etc., for garage.

Ont., Kenebec—Triangle Silver Mines, Ltd., W. H. Jeffrey, Purch. Agt.—1 drill compressor.

Ont., Kirkland Lake—Baldwin Gold Mining Co., Ltd., J. A. Cherry, Secy.—mining machinery and mill.

Ont., Kitchener—Salts & Chemical, Ltd.—equipment for proposed $1,000,000 plant for the extraction of glauber and other salts from a mineral lake at Dana, Sask.

Ont., L'Orignal—E. Le Blanc—forge, punch, shears, etc., for blacksmith shop.

Ont., Plantagenet—A. Robinson—emery stand and wheel for garage.

Ont., St. Eugene—O. Surprenant—vise, hand tools and chain hoist for garage.

Ont., South Indian—L. Bellefeuille—blacksmith shop equipment.

Ont., Sankleek Hill—T. D. McConnell, Main St.—emery wheel, stand, etc., for garage.

Ont., Sankleek Hill—Review Printing Co., W. J. Duncan, Purch. Agt.—job printing press.

Que., Barrette—H. Briere—sawmill equipment.

Que., Bellerive—E. Godard—drag saw, bandsaw, etc., for sawmill.

Que., Bellerive—S. Lacaille—woodworking machinery for veneer mill.

Que., Belle Riviere—H. Urbain—panel and mortiser machinery for sash and door factory.

Que., Hebert—Painchaud & Miquelon (sawmill)—bandsaw, rip saw, etc.

Que., Lachute—E. Charlebois—equipment for cabinet work, also for the manufacture and repair of furniture.

Que., Lachute—O. B. Lafleur & Fils, Ltd.—woodworking machinery for the manufacture of furniture.

Que., Lachute—W. M. Scott—stone cutting machinery.

Que., Mont Joli—R. Fournier—vise, bench tools, etc., for blacksmith shop.

Que., Mont Laurier—S. Ouellette—planing mill equipment.

Que., Mont Laurier—I. H. Portelance—cold saw, forge, etc., for blacksmith shop.

Que., Montreal—Z. Berthiaume & Fils, 694 Alma St., A. Berthiaume, Purch. Agt.—reamers, saws, etc., for lumber mill.

Que., Montreal—N. Blain, Ltd., 68 Casgrain St. (carriages, etc.)—wood and metal working equipment.

Que., Montreal—M. Carson, 421 Colonial Ave.—paper cutter with 20 in. blade.

Que., Montreal—The city, R. Bauret, Clk.—two automobile pumps, 1,000 gal. capacity.

Que., Montreal—Denmans, Ltd., c/o S. H. R. Bush, 112 St. James St.—machinery for manufacturing, curing and packing food products.

Que., Montreal—E. B. Evans, 600 Clarke St.—complete equipment for blacksmith shop.

Que., Montreal—J. Galipeau, 508 Moreau St. (patterns and models)—burr planer, etc.

Que., Montreal — Grauel & Co., 28 St. George St.—rip saw, cutoff saw, etc., for pattern shop.

Que., Montreal—Kenehan Wagon Co., Ltd., 225 William St., F. Kenehan, Purch. Agt.—shears, drills, etc.

Que., Montreal—Laurier Pattern Wks., 346 Delormier Ave., J. Laurie, Purch. Agt.—wood turning lathe.

Que., Montreal—P. T. Mitton, 1106 Clarke St.—woodturning lathe, planer, etc.

Que., Montreal—Nichols Chemical Co., Ltd., 222 St. James St.—compressor and concentrating mill.

Que., Montreal—Quebec Felspars, Ltd., c/o H. N. Chauvin, 232 St. James St.—crushing, washing and smelting equipment.

Que., Montreal—M. Zarbatany, 429 Viger St.—oil tank, pump and compressor.

Que., Rigaud—D. Brazeau—forge, bench tools, etc., for blacksmith shop.

Que., St. Amour—A. Legault—sawmill equipment.

Que., St. Anselme—A. Begin—foundry equipment.

Que., St. Hippolyte—D. Labelle—mortiser, planer, etc., for sawmill.

Que., St. Jovite—J. Venchestein—traveling carriage saw and bandsaw.

Que., St. Vincent de Paul—A. Jolicoeur—bench tools, etc., for automobile repair shop.

Que., Three Rivers—Three Rivers Harbour Comn., J. J. Ryan, Secy.—machinery for loading and unloading ships.

Que., Turgeon—A. Robidoux—swing cutoff saw, etc., for sawmill.

Nfld., St. Johns—Newfoundland Milling Co., Ltd., C. B. Jaqua, 453 Park Ave., Paterson, N. J., Dir.—equipment for flour mill at Harbour Grace.

Metal Working Shops

Calif., Alhambra (Los Angeles P. O.)—The Southern California Edison Co., 306 West 3rd St., Los Angeles, will build a general supply plant, including warehouses, shops, sheds, etc., here. Cost between $500,000 and $650,000.

Calif., Glendale (Los Angeles P. O.)—The Rogers Una-Drive Truck Corp., 105 East Colorado St., is having plans prepared for the construction of a 1 story, 70 x 390 ft. motor truck factory on Colorado St. Estimated cost $200,000. Austin Co., Bartlett Bldg., Los Angeles, Archts. Noted May 31.

Calif., Los Angeles—The Baldwin Motor Co., 1201 South Figueroa St., awarded the contract for the construction of a 4 story, 75 x 200 ft. garage. Noted Sept. 13.

Calif., Los Angeles—J. Delmas, San Francisco, is having plans prepared for the construction of an 8 story, 150 x 150 ft. garage on 6th St. and Kenmore Ave., here. Estimated cost $500,000. Walker & Eisen, Pacific Finance Bldg., Los Angeles, Archts.

Calif., Los Angeles—Gibson & Goodspeed, c/o Edwards Bldg. Co., contractors, 6330 Hollywood Blvd., awarded the contract for the construction of a 2 story, 65 x 225 ft. garage on Selma Ave. Cost will exceed $40,000.

Calif., Modesto—W. D. Miller awarded the contract for the construction of a 1 story, 80 x 100 ft. automobile service building on 11th and G Sts. Estimated cost $40,000. Shaw Motor Co., lessee.

Calif., Oakland—The Pacific Spring Bed Co., 180 New Montgomery St., San Francisco, plans to build a plant on a 3 acre site, here.

Calif., Oakland—The Victor Talking Machine Co., Front and Cooper Sts., Camden, N. J., will build a 1 and 2 story factory on 78th Ave., here. Noted June 7.

Calif., San Francisco—The Grinnell Co., 453 Mission St., manufacturer of automatic sprinklers and supplies, is having plans prepared for the construction of a 1 and 2 story, 90 x 240 ft. factory on 5th and Brannan Sts. Austin Co. of California, Santa Fe Bldg., San Francisco, Archts.

Calif., San Francisco—The Otis Elevator Co., 2300 Stockton St., has had plans prepared for the construction of a 2 story, 137 x 275 ft. shop and office building on Grant Ave. and Beach St. Cost will exceed $250,000. Private plans.

Calif., San Francisco—The Pelton Water Wheel Co., 19th and Harrison Sts., awarded the contract for the construction of a 2 story factory on Florida St. Estimated cost $100,000. Noted Sept. 6.

Calif., San Pedro—L. J. Harris, 1939 Gaffney St., is having plans prepared for the construction of a 1 story, 50 x 150 ft. garage on 13th and San Pedro Sts. A. G. Bailey, Junior Orpheum Bldg., Los Angeles, Archt.

Conn., Hartford—Long Bros., State St., are having plans prepared for the construction of a 1 story, 60 x 240 ft. garage on Market St. Estimated cost $40,000. F. C. Walz, Trumbull St., Archt.

Conn., New Haven—The Connecticut Co., 22 Church St., awarded the contract for the construction of a 1 story, 68 x 208 ft. garage and machine shop for automobile buses. Estimated cost $60,000. Noted Aug. 16.

Ill., Chicago—C. W. Lampe, Archt., 155 North Clark St., is receiving bids for the construction of a 1 story, 112 x 150 ft. factory on Adams and California Sts. for J. D. Wallace & Co., 1401 West Jackson Blvd., manufacturer of machinery. Estimated cost $50,000.

Ill., Chicago—The G. F. Marchant Co., Rockwell and 14th Sts., machinists, awarded the contract for the construction of a 1 story, 73 x 124 ft. addition to its factory. Estimated cost $40,000.

Ill., Chicago—Morton, Leviton & Co., Archts., 123 West Madison St., are receiving bids for the construction of a 1 story, 125 x 127 ft. garage and store at 921-35 North California St. for S. Skobel, c/o Archts. Estimated cost $60,000.

Ill., Mason—The Illinois Coal Corp., Old Colony Bldg., Chicago, awarded the contract for the construction of a 1 story, 40 x 140 ft. warehouse, 50 x 140 ft. shop, 60 x 60 ft. power plant, also hoist engine house. Estimated cost $150,000.

Ill., Maywood—Ulrich & Esch, 815 North 2nd St., are receiving bids for the construction of a 1 story, 57 x 100 ft. garage on 5th St. Estimated cost $40,000. J. A. Chicare, 8 North 5th St., Maywood, Archt.

Ky., Lexington — The Baker Car Co., Lafayette Bank Bldg., plans to build a 1 story, 80 x 400 ft. factory. Estimated cost $30,000.

Ky., Louisville—The Standard Sanitary Mfg. Co., 6th and Shipp Sts., is having plans prepared for the construction of a 1 story, 65 x 200 ft. enameling shop, including six ovens. Estimated cost $75,000. F. Erhart, Norton Bldg., Louisville, Archt.

La., Shreveport—Hughes Bros. are having plans prepared for the construction of a 1 story garage and salesroom. Estimated cost $20,000. S. Van Os, Merchants Bldg., Shreveport, Archt.

Md., Baltimore—The Bd. of Fire Comrs., Clay St., plans to build a repair shop.

Mass., Boston—The Hunt-Spiller Mfg. Co., 383 Dorchester Ave., awarded the contract for the construction of a 135 x 140 ft. foundry. Estimated cost $150,000. Noted May 31.

Mass., Boston—T. S. and E. J. Owen, 174 Blue Hill Ave., awarded the contract for the construction of a 2 story, 75 x 112 ft. garage on Rand St. Estimated cost $50,000.

Mass., East Walpole—Bird & Son, manufacturer of roofing products, awarded the contract for the construction of a 1 story, 80 x 140 ft. machine shop. Estimated cost $40,000.

Mass., Waltham—The J. L. Thomson Mfg. Co., South St., manufacturer of riveting machines and hammers, awarded the contract for the construction of a 3 story, 50 x 225 ft. machine shop. Estimated cost, including machinery, $100,000.

Mass., Williamsett (Holyoke P. O.)—B. F. Perkins & Son, 1 Crescent St., Holyoke, awarded the contract for the construction of a 2 story mill building on Chicopee St., here, the first unit of larger plan. Estimated cost $50,000.

Mass., Worcester—The Hyde Machine Co., 13 Hope Ave., awarded the contract for the construction of a 2 story, 72 x 100 ft. addition to its factory. Cost between $40,000 and $50,000.

Mich., Lansing—The Federal Drop Forge, South Washington St., awarded the contract for the construction of a 1 story, 50 x 60 ft. heat treatment plant.

Mich., Lansing—The Olds Motor Wks., foot of Division St., awarded the contract for the construction of a 1 story, 37 x 100 ft. heat treatment plant and a 1 story, 40 x 40 ft. oil storage building.

Mo., Kansas City—A. F. Seested, c/o Kansas City Star, 1715 Grand Ave., is having plans prepared for the construction of a 3 story, 64 x 246 ft. garage, machine shop and sales rooms. Estimated cost $100,000. J. G. Brecklein, Federal Reserve Bank Bldg., Kansas City, Archt. Oakland Motor Car Co., 1521 McGee St., lessee.

Mo., St. Louis—N. B. Howard, Arcade Bldg., is receiving bids for the construction of a 2 story, 106 x 124 ft. garage.

Mo., St. Louis—W. E. Rhodes, 715 Chestnut St., awarded the contract for the construction of a 1 story, 50 x 100 ft. garage on Easton St. Estimated cost $40,000.

Mo., St. Louis—A. Roy, 4455 Manchester Ave., will build a 1 and 2 story, 98 x 125 ft. garage. Estimated cost $40,000.

Mo., St. Louis—The Wabash Ry. Co., Railway Exch. Bldg., awarded the contract for the construction of an addition to its locomotive and car repair shop on 7th St. Estimated cost $175,000.

N. Y., Brooklyn — The Kenmore Bldg. Corp., c/o M. Courland, Engr. and Archt., 389 5th Ave., New York, will build a 2 story garage on Tillary St., here. Estimated cost $50,000.

N. Y., Brooklyn—G. Merceca, c/o C. P. Cannella, Engr. and Archt., 1163 Herkimer St., will build a 1 story garage on Norwood Ave. Estimated cost $45,000.

N. Y., Brooklyn—C. Modica, c/o T. Goldstone, Engr. and Archt., 50 Graham Ave., will build a 1 story garage on East 29th St. Estimated cost $75,000.

N. Y., Buffalo — The Ford Motor Co., Highland Park (Detroit P. O.), plans to build an assembly plant on a 40 acre site, here. Cost will exceed $500,000.

N. Y., New York—The Dykman Heights Realty Co., c/o Shampan & Shampan, Archts., 188 Montague St., Brooklyn, will build a garage on 213th St., here. Estimated cost $100,000.

N. Y., New York—H. Hoffman, c/o H. A. Koelble, Archt., 114 East 28th St., awarded the contract for the construction of a 4 story garage on Mt. Eden Ave. Estimated cost $80,000.

N. Y., New York—The Lorington Constr. Co., c/o G. E. Milter, Engr. and Archt., 1482 Bway., will build a garage on Longfellow Ave. and 139th St. Estimated cost $150,000.

N. Y., New York—The Maxmoor Realty Co., c/o J. M. Felson, Engr. and Archt., 1133 Bway., will build a garage on Jackson Ave. Estimated cost $75,000.

N. Y., North Tonawanda—The Amer. Kardex Co., Inc., Main St., plans to build an addition to its plant. Cost will exceed $100,000.

N. C., Charlotte—The Pyramid Motor Co., 403 North Tryon St., plans to build a 3 story, 70 x 200 ft. garage. Estimated cost $75,000. Engineer or architect not selected.

N. C., South Rocky Mount (Rocky Mount P. O.)—The Atlantic Coast Line Ry., Atlantic Coast Line Bldg., Wilmington, will receive bids until Oct. 10 for the construction and 1 and 2 story, 100 x 320 ft. and 50 x 150 ft. coach shop and a 1 and 2 story, 100 x 320 ft. and 50 x 200 ft. paint shop, here. J. E. Willoughby, Ch. Engr.

O., Akron—The Anaconda Copper Mining Co. plans to build four 2 story mill buildings at Bettes Corners. Estimated cost $500,000.

O., Canton—The Arctic Ice Machine Co., 916 Market Ave., S., plans to build a 2 story addition to its factory. Estimated cost $23,000.

O., Cleveland—The Cleveland Refrigerator Co., 6600 Sideway Ave., awarded the contract for the construction of a 1 story, 88 x 124 ft. factory. Estimated cost $5[illegible],000. F. Pietrowsky, Pres.

O., Cleveland—The Eaton Axle & Spring Co., East 65th St. and Central Ave., is having plans prepared for the construction of a factory. Estimated cost $100,000. G. S. Rider & Co., Century Bldg., Cleveland, Archts.

O., Cleveland—A. W. Harman, Society for Savings Bldg., is having plans prepared for the construction of a 3 story, 65 x 120 ft. garage at 1718 East 18th St. Estimated cost $100,000. A. Sogg, 319 Hippodrome Bldg., Cleveland, Archt.

O., Cleveland—R. C. Patton & R. T. Hisey, 536 Engineers Bldg., are receiving bids for the construction of a 1 story, 45 x 280 ft. garage on East 82nd St. and Crawford Rd. Estimated cost $60,000. L. Skolnik, 6th St. Clair Bldg., Cleveland, Archt.

O., Galion—The Galion Iron & Mfg. Co. is having plans prepared for the construction of a 1 story, 50 x 160 ft. foundry. Estimated cost $50,000. A. Jones, Market Bldg., Galion, Engr.

O., Steubenville—F. Scott, Studebaker agent, is having plans prepared for the construction of a 2 story automobile service station and garage. Estimated cost $100,000. W. S. Ferguson Co., 1900 Euclid Ave., Cleveland, Archts.

O., Warren—The Packard Electric Co., manufacturer of transformers, awarded the contract for the construction of a 2 story, 110 x 220 ft. addition to its plant. Estimated cost $350,000.

Pa., Johnstown—The Penn Public Service Co., 535 Vine St., awarded the contract for the construction of a 2 story, 56 x 106 ft. garage on Fend St. Estimated cost $70,000. Noted Aug. 30.

Pa., Phila.—The R. W. Hartnett Co., 1010 Race St., awarded the contract for the construction of a 3 story, 49 x 93 ft. factory for the manufacture of printing machinery at 1025-27 Cherry St. Estimated cost $50,000. Noted Sept. 6.

Pa., Phila.—C. W. Rudisnill, c/o N. Peafey Co., 1615 Spruce St., is receiving bids for the construction of a 2 story, 130 x 156 ft. garage on 55th and Sansom Sts. Estimated cost $200,000. Private plans.

S. D., Rapid City—H. E. Swander is having plans prepared for the construction of a 2 story, 75 x 140 ft. garage. Estimated cost $40,000. J. C. Ewing, Rapid City, Archt.

Tenn., Memphis—The Ford Motor Co., 740 Union Ave., C. Alexander, local representative, plans to build an assembly plant on Riverside Blvd.

Tex., Amarillo—The Amer. Metal Co., c/o Chamber of Commerce, is having plans prepared for the construction of a zinc smelter. Cost will exceed $500,000. Private plans.

Tex., Amarillo — The New Jersey Zinc Co., c/o Chamber of Commerce, is having plans prepared for the construction of a zinc smelter. Private plans. Cost will exceed $500,000.

Tex., Dallas—The Ford Motor Co., Highland Park (Detroit P. O.), Mich., is having plans prepared for the construction of a 2 story, 150 x 200 ft. automobile assembly plant, here. A. Kahn, 1000 Marquette Bldg., Detroit, Archt.

Tex., Dallas—J. E. Morris, 120 North Lancaster St., plans to build a 1 story, 75 x 185 ft. garage on 9th and Lancaster Sts. Estimated cost $50,000. Engineer or architect not announced.

Tex., Fort Worth—The Edrington Investment Co., 13th and Lamar Sts., awarded the contract for the construction of a 2 story garage. Estimated cost $115,000.

Tex., Fort Worth—The P. Garrett Motor Co., 1107 Commerce St., plans to build a 2 story garage. Engineer or architect not announced.

Tex., Fort Worth—The Texas Steel Mills will build a steel mill, including blast furnace, etc., on South Hemphill St. Estimated cost $80,000. J. F. Foster, Supt. Constr.

Va., Portsmouth — The Southern Brake Shoe Co. plans to build a foundry along tracks of the Belt Line R.R.

Wis., Delevan—A. Schumacher is having revised plans prepared for the construction of a 2 story, 36 x 68 ft. and 20 x 62 ft. garage. Estimated cost $50,000. H. C. Hengels, 445 Milwaukee St., Milwaukee, Archt. Noted May 24.

Wis., North Milwaukee—The North Milwaukee Fdry. Co., Commerce Ave., is receiving bids for the construction of a 1 story, 65 x 100 ft. addition to its foundry. Estimated cost $40,000. Private plans.

Wis., Racine—The Racine Investment Co., 401 Lake Ave., awarded the contract for the construction of a 2 story, 80 x 120 ft. garage on Lake St. Estimated cost $50,000.

Wis., Rice Lake—The C. O. Ronning Co. will soon re-advertise for bids for the construction of a 2 story, 50 x 160 ft. garage. Estimated cost $60,000. Johnson & Griswold, Wisconsin Block, Superior, Archts. Former contract rescinded. Noted July 26.

Wis., Plymouth—J. E. Curtiss plans to build a 2 story garage and repair shop. Estimated cost $40,000 Engineer or architect not selected.

Ont., Elora—The T. E. Bissell Co. plans extensions and alterations to its plant for the manufacture of farm implements. Estimated cost $30,000.

See the SEARCHLIGHT SECTION *Pages* 174-185